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The Mechanism of Electrolysis by Means of Alternating Currents.

The absence of any electrolytic action by an alternating current in a solution of copper, for example, is generally explained by saying that the copper deposited on each electrode by one current is immediately dissolved by the opposite current. In the course of their experiments the authors have been able to render this action visible.

It would seem that the phenomenon depends upon the existence of a state of equilibrium between the rapidity of decomposition of the electrolyte and the rapidity of re-combination of its elements. The most important factor in determining the rapidity of electrolysis is the current density. Now this can easily be increased by diminishing the surface of the electrodes, the current being kept constant. A voltameter, when filled with acidulated water, produced an abundance of hydrogen and oxygen with a current of 2.5 amperes; but on replacing the acidulated water by a solution of sulphate of copper, no electrolysis was set up until the electrode surface had been reduced to about six square millimetres, when gas was evolved and copper at the same time deposited. The material of the electrode also influences the result. Of greater effect is the number of alternations of the current. An alternate current machine was driven at increasing speeds so as to vary the number of alternations, while, by means of an adjustable resistance in the exciting circuit, the current was kept constant.

With 133 alternations per second, the current was adjusted until re-combination of the elements just balanced electrolytic action; on diminishing the number of alternations to 100 per second, electrolysis took place. Again, the current, having 133 alternations per second, was brought to such a strength as to produce an abundant development of gas; when the alternations were increased to 173 per second, all evolution of gas ceased.

The effect of a change in the current density is just contrary to that of a change in the number of alternations per second; therefore, even currents of small surface density may produce electrolysis if the number of alternations are sufficiently reduced. This explains how it was that De la Rive was able even with a large electrode surface to produce electrolysis by means of the current of a magneto machine, since it gave only about 50 alternations per second.

Electric Lights Wanted in Williamsport, Pa.

The city of Williamsport, Pa., although one of the most progressive cities in the State, with a population of over 30,000, has never adopted the electric arc light for street illumination, continuing the gas lamp post for that purpose. Over two years ago an effort was made by the Thomson-Houston Company to secure a contract with the city, which failed. The councils advertised for bids, and the Thomson-Houston, Fort Wayne Jenny, and the American companies all bid, and the latter company, being the lowest bidder, was recommended the contract, which councils failed to have executed. They now expect to advertise again for 200 arc lights, and as the tax was levied and paid by property holders for electric light, they are urging councils to secure them light, either by erecting a plant and operating it by the municipality or from some responsible light company. The present council appear to urge a new company, who will furnish incandescent light, also in competition with the Edison Electric Illuminating Company, who have already an excellent plant of large dimensions.

Efficiency of Glow Lamps with Direct and Alternating Currents.

The problem to be solved is whether a Board of Trade unit is more valuable for lighting by glow lamps when the current supplied to the consumer is direct or when it is alternating. The complete solution of the problem involves the factor of the life of lamps under the two conditions, since the cost of renewals ought to be taken into consideration; but as data on this point are wanting, the experiments dealt only with the other factor of efficiency. By an ingenious arrangement of circuits with intercalcated resistances, and of switches, the glow lamp under observation could be supplied either with the alternate current furnished by a Ferranti machine, or with the direct current of the Gramme exciter.

The currents were measured by a specially constructed electro-dynamometer, wound with unusually fine wire, in order to obtain, as far as possible, uniform current density. This led to waste of power in the instrument, which, however, was of no consequence in the actual investigation. The potential difference at the lamp terminals was measured by a non-inductive volt meter, and the intensity of the light compared on a photometer with that of a standard candle, observations being made with both ruby red and signal green glasses.

It is known that with alternating currents the measured watts do not equal the true watts. To obtain the correct value we have

$$\text{True watts} = \frac{r\,T\sqrt{A^2\,V^2}}{\sqrt{l^2\,n^2 + r^2\,T^2}};$$

and in this particular case $\sqrt{A^2}$ is the square root of the mean square of the amperes measured on the electro-dynamometer, $\sqrt{V^2}$ is the square root of the mean square of the volts measured on the non-inductive voltmeter, T is the time between one alternation and the next—*i.e.*, half a complete period—*r* is the resistance of the lamp filament in ohms, and *l* is its coefficient of self-induction in secohms.

The observations—75 in number—were made alternately with the direct and with the alternating current. With green light, the alternating current gave 2.857 watts per candle, and the direct current 2.811 watts per candle; with red light the figures were respectively 3.247 and 3.286. The mean of all the 75 observations gave for the alternating current 3.0497 watts per candle, and for the direct current 3.0490 watts per candle. This very small difference, the authors consider, may be set down to experimental errors, and they therefore come to the conclusion that the efficiency of a glow lamp is the same for both direct and alternating currents.—*Phil. Mag.*

The Connecticut Motor Company.

In our issue of March 16th we mentioned the Connecticut Motor Company as being in the market with motors of one, two and three horse-power, and considering that the company was but organized in the fall of 1888, we considered this to be pretty fair progress. We are happy to state that these motors are now manufactured of from one-half to 10 horse-power inclusive; all being, so far, plain shunt wound for equi-potential circuits of 110 and 220 volts, though the company is already engaged in adapting its motor to constant current circuits.

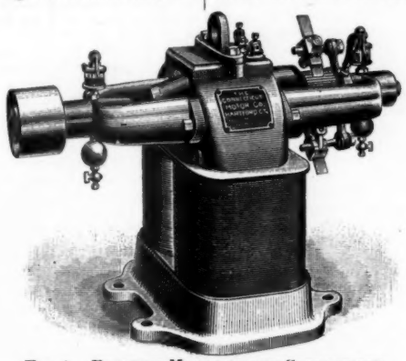

FIG. 1.—ELECTRIC MOTOR OF THE CONNECTICUT MOTOR COMPANY.

This is an instance, were such needed, showing that the manufacturers of Connecticut can "hold up their end" in so far as rapidity of movement is concerned; and it may even be added as far as quality of work is concerned also, as an inspection of this motor will amply prove. Its application is almost unlimited; it may be seen running in a store window at 17 Dey street, or a planing machine at the works of the Pratt & Whitney Company in Hartford. Our readers can doubtless supply for themselves many applications intermediate to those cited.

A good view of the salient features of the Connecticut motor—for some of which patents have been applied—is given by Fig. 1. Fig. 2 shows a portion of the testing and experimental department in the company's factory at 42 Union Place, Hartford, Conn.

Ore Separator.

The Edison magnetic ore separator is to be tried on a large scale near Bechtelsville, Penn. A 150 horse-power engine, a Brennan crusher, three pairs of corrugated rolls and necessary conveyers, pockets, belts, etc., have been installed, and two 80 horse-power boilers. Mr. O. S. Hussey, formerly of the Edison Laboratory, is superintendent of the plant, and is mystifying the local scribes by his uncommunicativeness.

International Congress of Applied Mechanics.

There will be held at Paris in September of this year, at the Conservatoire des Arts et Métiers, an International Congress of Applied Mechanics, under the patronage of a Committee of Honor, comprising savants and engineers of renown both from France and from other countries, who will give the work of the Congress the benefit of their influence and the weight of their authority. The President of the Committee on organization is Monsieur Phillips, ex-inspector general of mines (retired). The five members appointed from the United States are, in the order of their mention on the official bulletin, Messrs. Robert Grimshaw, President Polytechnic Section Am. Institute, N. Y.; R. H. Thurston, director, Sibley College of Cornell University, Ithaca; Prof. Egleston, Columbia College School of Mines, N. Y.; and the Presidents of the American Societies of Civil and of Mechanical Engineers.

At this Congress, among the important subjects submitted for discussion are the unification of the horse-power; the choice of materials in machine construction; the mechanical production and utilization of artificial cold; transmission to a distance, and distribution of work by other means than electricity (water, air, steam, cables, etc.); automatic cut-off engines with several successive cylinders; thermo-motors other than the steam engine.

Other topics, treated by papers, will be improvements in steam engines since 1878; progress among associations of owners of steam appliances; and improvements in apparatus for the generation of steam, more particularly sectional boilers.

Nomination of Officers of the Electric Club.

The regular meeting of the Electric Club, for nominating officers for the year beginning May 1st, 1889, was held at the club house, Thursday evening, March 21st. There was a representative attendance; and after a brief interchange of views, the nominations were made.

Two names were placed in nomination for the position of president, Messrs. E. T. Gilliland and O. E. Madden. One candidate each was placed in nomination for the other offices, as follows: Vice-presidents T. N. Vail, E. N. Dickerson and Ex-president H. C. Davis. Treasurer: Willard L. Candee. Secretary: Chas. W. Price. Board of Managers: H. D. Stanley, M. W. Goodyear, A. A. Patterson, H. A. Reid, Geo. B. Coggeshall, Chas. W. Spear, C. O. Baker, Jr., E. M. Hamilton, C. W. Gould, S. D. Field, H. L. Storke, C. E. Stump, Geo. M. Phelps. Committee on Membership: Henry Hine, chairman, Geo. T. Manson, Geo. Worthington, Lieut. F. W. Toppan, U. S. N., J. J. Carty.

The committee reporting names for nomination, composed of Messrs. Chas. W. Spear, Geo. F. Porter and A. F. Stanley, was authorized to fill any vacancy that might occur in the list of officers nominated, should any be unable to serve, and the Club adjourned to meet on the third Thursday in April (the 18th inst.), at which time the annual election will be held.

"LIGHT AND COLOR."

The Address on the Above Topic Delivered by Prof. Robt. Spice, Before the Electric Club, March 14, 1889.

We will begin with an experiment and if we are successful the light we are going to use is the light we ought to use for such a purpose, that is the arc light. And I may perhaps pause for a moment in reference to the meaning of that term and ask, Why is it called the arc light? That takes me back about 40 years—not me; I do not go back 40 years of course—it takes the subject back about that time. In those days the method of getting the arc light was by means of a very uncertain arrangement called a primary battery, and it so happened that the insufficiency of the knowledge at that time as to resistance and so on, was such that the current was improperly regulated to the lamp that was to be used. As a result, in general, the amount of current was insufficient for the lamp. If you operate on a small current and a pair of carbons and examine the light critically, that is to say, the glow that surrounds the carbon poles, it will be in the shape of an arc.

But if the current is of sufficient strength to produce a good light you will not find this to be the case. A complete glow will surround the carbons and it will be quite globular and not an arc. Sometimes it will drift into the arc, but in general it should be pretty nearly globular, and if we had to define the light to-day I question if we should call it an arc light.

Now starting with refraction, I will take the word itself—and I may say that throughout to-night I will depend absolutely on the experiments that I propose to make. You are all experimental gentlemen and I presume you will have greater confidence in the result of an experiment and in your own judgment on it than on a lot of mathematical description that might or might not be satisfactory. Now with reference to this word refraction, the original meaning of the term was the breaking back of a ray of light. We will begin by making an experiment to first of all start our light and then we will make a preliminary experiment on this refraction, so I will ask Mr. Chamberlain to be good enough to put out some of the lights in the room so that we can turn on the light and see that we get the arc light on the screen the first thing, and then put a slice of light on the screen afterwards to see whether we can break it back or refract it. (Illustrating.) Decreasing the size of the lens by a diaphragm you see the carbons on the screen, with which you are familiar, and the little glow which I am keeping down to-night in order to run without any stoppage all the time. Now moving the lamp a little to get a change of the direction of the rays, I will put a holder for the slides in and we will decrease that to a slice of light by putting a glass plate in front as you see, afterwards focusing that by means of a lens on the screen. There we have simply a slice of light to begin with. If I take a piece of glass which I hold in my hand here to show you about what it is like, a thick piece of plate glass with parallel sides flat against the slide, so that the beam goes through it perpendicularly, it simply makes it a little dark. If I turn the glass at an angle we break back a piece of the light and that is refraction. Wherever I move the glass you see the light is broken back or cut out.

So much for the first statement of the fact that we can refract light? Now this refraction can not only take place in glass, but it can also take place in water, and if the surfaces of the glass are not parallel as this was, then we may succeed in making it break twice, carrying it a little further, taking a vessel shaped like a prism containing water. For this purpose I will make a few changes. Therefore I put a little different arrangement in front of the lantern and this time instead of putting in a slit I put in a plate with a small hole in it and we get a disc of light on the screen which we will focus pretty sharply. If in the path of that light I interpose a prism you will see that we deflect the light downwards on the screen by a certain amount, and by a judicious management of the prism we can let part of the light go above and part below, and instead of seeing *one* moon we see *two*. Now, as some of us know by experience, it is not always necessary to have a prism in order to see two moons instead of one. (Laughter.) If I take a second prism and put it in front of that, it would simply increase the deflection and it goes to the bottom of the screen. Furthermore, it will also go towards the thick side of the prism—by rotating the prism I throw it upwards. I will ask you to notice that the upper and lower borders of that disc are colored. The upper is blue, the lower is red. If I turn it, at first the lower one is blue and the other is red; and if I put in a second prism, turning that up, you see the blue and red *increase* immediately. If I put the two prisms in opposition, the edge of one to the base of the other, we shall bring back the light exactly to where it was, and the refraction has stopped. If we pursue our experiments a little further and instead of confining our attention to a water prism, take a glass prism, we will get another effect altogether. But for this purpose a spot is not exactly a suitable thing, and instead of a hole we have to take a slit once again. You will notice the light will run down from time to time, and a little color comes on the screen due to the turning of the carbons and the lowering of the central position of the light. Putting in a slit, and this is an adjustable one that I can work by means of a screw, we again get our slice of light, and here in passing I wish you to notice, and ultimately we shall find it important, that the slit is not a *wide* one. Now I will interpose in the path of that a glass prism instead of the water prism, putting the thick part of the glass toward the wall, and therefore we should expect the light to be deflected in that direction. But we shall find it is deflected in a somewhat curious way, and we have that band of color on the wall which you notice over there. That band is called the "spectrum." (Applause.) I will deal with this spectrum very largely to-night, and therefore I am going to ring the changes on the method of doing it. Here is another kind of glass prism. Putting this in the place of the other you see it moved a little further towards the picture, and once more holding up the piece of card you see that it is a wider spectrum. Lastly we can take another kind of prism that will turn it around again and yet not lose all the color, because some of the dispersion will remain and we can get the spectrum on the screen in *front* instead of *sideways*, as you see there. That is glass. And lastly I will take one other prism, which is a hollow one, filled with bi-sulphide of carbon. In a moment I will put that in front of the lens and you will see that we get a very beautiful spectrum in front. (Illustrating.) (Applause.)

Some of you may not have heard the origin of that word spectrum as applied to that band of color. It goes back to the time of Isaac Newton. He was, as you know, a gentleman who made a remark about an apple falling from a tree. People generally thought that it just dropped down; but he said it did not, and he called it "gravity."

Before he tried the experiment with the prism he tried some physiological experiments, and these experiments consisted in looking at the sun and finding the after effect in his eye. Now, probably most of us look at the sun more or less; but Newton stared at the sun persistently, and afterwards he was affected with a great deal of trouble in the eye, which ultimately caused blindness which he endured something like three years. During that time, and at the beginning of it, he always had this trouble, that wherever he turned his gaze there was the effect of seeing an image of the sun—wherever he looked there was a disc of the sun in various colors, blue, green, red, yellow, and so on, all the colors that we notice in a rainbow. Now, in those days, in order to be fashionable it was the proper thing to express your views in Latin—English not being fashionable—and if you did not do that you were out of the fashion.

Therefore, Newton, in writing about this to a friend as to the effect of the sun, wrote in Latin, and he wanted to express this fact that he saw the ghost of the sun. The Latin word for ghost is "spectrum," and so he called it by that name; and some years subsequent to that Newton made his celebrated experiment in passing a sunbeam through a prism, and then, for the first time, Newton saw these colors. It naturally reminded him of his old trouble in looking at the sun, and he said, "That is my old friend the ghost, or spectrum of the sun." (Applause.)

Now, you will notice that we have used a slit. Now I am going to enlarge that slit by turning the screw, and I am not quite sure whether this particular prism is the most suitable. I will ask you to watch the effect on the screen while I increase the size of the slit. Matters are getting brighter considerably; but if you give a little attention you will find that as the red recedes from the blue, in the place of the natural pure yellow we are getting to have the effect of whiteness. I will draw your particular attention to that, that when I increase the slit so that instead of being a slit it is a broad space of light, we no longer have the spectrum but a patch of white light creeps in. If I take the slit away altogether and leave the disc, one side is colored red, the other blue, and in general we have a large amount of white. Withdrawing the prism instead of the slit, you will find we have quite a wide slit to what we had before. The question presents itself, why must we use a *narrow* slit? I will approach this question step by step, coming back again to the narrow slit to show that we do get a good result from the narrow slit by turning the screw and moving the edges of the plates together; we find that we get what we call a real spectrum, the colors passing by imperceptible degrees from one to the other; that there is no whiteness about that spectrum—there is nothing but pure color.

We have decomposed the light entirely. Now, why should that be so? We will take that up in this simple way: We have to use other slides, and I will begin by using two slits side by side, and taking this mechanical slit. Then you first get two slits. Putting up the prism again, you see we have *two* spectra. Now, that is natural. If you get one spectrum with one slit, you ought to get two spectra with two slits. Let me direct your attention to a singular effect—that if I had drawn those slits a little nearer, you will perceive the violet of this spectrum would have overlapped the red of the other. It is because these colors overlap when we have a big slit that we get this effect of whiteness. By a totally different slide I will prove this to you in another way. Taking out the slide we had a moment ago, I introduce a very curious slide, a series of steps. Now, let me point out what we have got there. That is the width of the slit. That top one is a short and narrow slit. Press that down and you will see that if you press the other up we would have our broad slit. We put in our prism here, and we get the effect of a series of beautiful steps, and those steps will tell their own tale. (Applause.)

I am going to attempt an experiment. I think I will succeed, but I am not certain, because there is a difficulty in it. It is due to the probability of breaking the mirror which I am going to use. First of all we come back to our original small slit, and I am going to make this as small as possible for the purpose. I am not going to use that bi-sulphide of carbon prism at present, because I think it would be really too big for the purpose. I am going to use the small glass prism that I used at first, and I will throw the spectrum over towards my side of the room. (Illustrating.) Over there you notice that we have our spectrum. Now, I take up a piece of looking glass. I show you the glass. You will see what I have here, just a strip of thin looking glass. You see about the length, a little over a foot long, and very thin. First of all I will feel around till I find that spectrum, and having found it, I will reflect a part of it on the screen. There, I am reflecting that on the screen, a little wavy, because the glass is not perfect. Now, if I bend that glass, the ends from me, I make it concave towards the light, so that it is a part of the cylinder, then it will tend to reflect the various colors in the same part of the screen. If I am successful, I ought to be able to get back my colorless slip. Now, we will try the experiment, getting the right position on the screen, and cautiously bending this. After a time you will see that I get very nearly a white slit on the screen. Now, there we have got it, almost white, in the middle of the screen. (Illustrating.) If I bend it the other way, bend the ends toward me, you will see I increase the length of that spectrum; but bending it the other way we get the colors together until we have got a white slit on the screen. (Applause.) Thus by a pure piece of mechanical experiment we cast these colors in the light together, and when they are made to cover the same part of the screen, we get back the same white light we started with. It is simply a question of method, no theory or anything about it but a *fact*.

I have a disc, a card here, which I am going to introduce in front of the lantern, so that we can at will, cut off as much of the light as we like, and furthermore cut it off periodically. Secondly, I place in the slide holder a glass which is covered with tin foil with the exception of two squares and these squares are occupied by colored glass. In a moment or two we will get matters arranged so that you will see the colored glass when I get it focused by the lens in front of the screen. From time to time it has been my business in life to present these things as experiments, partly to students, partly to the public, and one cannot very well be in the habit of doing such things all the time without devising certain little methods to prove points, and therefore, in the course of the evening, I shall probably show you some little things that you will not see elsewhere, because they are due to my own work. I do not take any special credit for it. If a person worked continuously and never did anything original, it would be a sign he ought to stop work. Here is a little piece of green glass and the other piece is red. This is simply a disc, or as it is called, a diaphragm. We call it a diaphragm so that people will *understand* us—which they wouldn't do if we called it a card. There you perceive we have a piece of red glass. At no time do you see both glasses at once and some of the time you do not see either. I will rotate this slowly. After a time the disc shuts out the red. Now there is nothing. I turn it a little further and for a time the green is uncovered. Now the green is covered and there is nothing. It is important to notice that you cannot see both of those at once and very often you do not see either. If I rotate that disc so quickly that less than a tenth or a fifth of a second elapses, you will nevertheless see them both at once. After a time they flicker and now you have both the red and green disc on the screen, notwithstanding that, as far as the physical possibilities are concerned, they are not really on the screen at the same time. Though we apparently see the two things at the same time by retaining the impression they are not there together. There is an old saying that "seeing is believing" and so it is, but a good deal depends upon what you believe. I will try one more experiment to illustrate this point. There used to be an old experiment with a stick, to make one end red hot and whirl it around and show the light which was due to the persistence of vision. I will show you an improvement on that experiment. I have a disc of zinc with one hole in it which I put up in front of the lantern, and after a few moments I focus the hole on the screen. If I rotate the disc slowly you see the spot travels around; it goes behind a post; you do not see it for that reason all the time. If I succeed in making that go around the screen quick enough, so that it goes once around in less than our unit of persistence, the result is that we get a perfect circle of light on the screen. Here again we have another case of this persistence of vision in which we see something that is not really there.

Now, that is simply an illustration of a fact in physiological optics which we are going to utilize, and hence I come to the experiment, which is simply another way of proving that the colors of the spectrum when united will form white light. For that purpose I put on a disc, and this disc is a disc of glass on which are four pieces of colored glass, red, green, yellow and violet. (On rotating, a white disc is seen on the screen)—I will have more to say about that afterwards—the colors of the spectrum are supposed to be what are called the seven colors of the rainbow. But that theory is exploded. We do not bother about seven, three or four or five, now-a-days—we do not care much about that; but for the present you see I have selected four. Afterwards, when we come to use the spectrum again for certain purposes, you will find it difficult to determine more than four colors in that spectrum. You will not be able to count the seven. Nobody has ever done it yet, only Newton, but he was a great man.

You know that one end of the spectrum is reddish, the other blue. You see these colored glasses are by no means pure. A blue glass lets lots of green through, but you will remember that a red glass lets nothing but red through. If we put up a blue and a red glass together, what will be the effect. Let us assume red is the first glass. It would obviously let no color through but red. If we follow that by blue it will let the blue and green through, but practically no red; so that though these two are perfectly transparent, it should follow that the two together, although completely transparent, should be opaque. There is the blue; there is the red. Now I put the two together, simply the blue and the red, and on interposing these you see we cut out the light *entirely*. Those two transparent bodies can be made absolutely opaque to light if they are put in a proper manner. (Applause.)

I have dealt with color with reference to itself. I have dealt with one problem of the eye, that is, this persistence of vision; I have simply utilized a property of the eye in order to prove a point in the question of the rotating discs. Now I have to touch on something more important. There has been a great amount of discrepancy in the description of colors by different people and for a long time we did not know why there should be this strange discrepancy. But it appears it is due to want of knowledge of the eye itself. This carries us back to the time of Thomas Young. Then came Helmholtz, the great German authority, and, finally, at the present time we have an authority of great weight, Prof. O. N. Rood, of Columbia College, of New York. Taking the work of these three men we may state their theory with confidence in reference to the eye, and I may be excused perhaps for making a personal remark, and that is, we have had a considerable lack of experiment as to theory, and I have been engaged myself for three or four years making experiments in order to prove this beyond a question, and some of these latest experiments I have not had the pleasure of showing to the public at all, but only to my pupils. I bring before you to-night for the first time, experimentally, the theory of what is seen in the eye. There are a set of nerves which are believed to be three; that one of these nerves is sensitive to red light, the second is sensitive to green light, and the third to what we call violet. These require a little definition. The red is clear, green is clear, if you can find a pure green, but the violet is something which is not blue, something which is on the further side of blue. If you look at a spectrum, first comes the yellow, then the green, then the blue, and the continuation of the blue is what is called violet. I mention this emphatically for this reason, that the popular idea of a violet is wrong; but the violet that I am speaking of now is something that would remind some people of a kind of purple, but is really an elementary color that cannot be decomposed. To come back again, the three nerves are red, green and violet, and there is no nerve for yellow, and none for blue. If that is so, we ask, How do we appreciate the vast number of colors in nature? The answer is that if

you take a piano and send into it some one note, you will find some one wire will respond. That is called sympathetic resonance, but you will find that some wire near by *also* responds, but not as much as the first string. In other words, a body may be a little out of tune and yet be affected by sympathetic resonance to some extent.

First of all, how do we get a yellow? We see yellow simply because yellow is the result of the action of the red and the green nerves; both of these nerves are set in vibration, and as a result we get the mental impression which we are pleased to call yellow. If our theory is right, this red and green disc, if rotating, should result in a yellow color on the screen. (Illustrating.) I rotate it and you see that red and green do produce a yellow color as stated. Then, so far, there is no doubt that we can have a yellow color in the eye without having a yellow color on the screen. But we have a much more certain method of proving this, and that is by a special property of all the nerves and all the muscles. When you do things continuously for a long time you get tired, and whether this is a muscular or nervous effect, it is true. Now, suppose we have a means of tiring any given nerve; it will not be in a condition to accept an impression from that source as strongly as the other nerves, so that if given a certain color we tire out say the red nerve, and then present a white light to it, the red nerve will be a little behind hand, and we will not get an effect as strong as we should do. I am going to make an experiment as rapidly as I can and I haven't got time to write them out; and then again the experiments I have the pleasure of getting up myself are gotten up simply because I like to get them up. But sometimes we do meet with a little misfortune. Sometimes other people will afterwards bring one's experiments out and claim them for their own, and I had a peculiar incident happen to me in that connection a little while ago. I gave a lecture, and there was a person present who was so pleased with it that he made up his mind that he would get one up and show it himself in a lecture. Some little time afterwards I happened to go to a lecture by this gentleman and he put this slide on a screen, and the only peculiarity was that after he had shown the slide somehow or other he had forgotten my explanation and he couldn't use it. That is the only satisfaction I had—he did not know what to do with it when he had got it on the screen. This bears on another point—you know when ladies go to a store to buy silk dresses—if you had no personal experience you have probably read it in a book—they look at colors—they are very good judges of color, particularly colored materials that are high in price—and when they go to look at these things and become tired through looking at one color in fabrics, their judgment gets weak and they cannot judge so well, and they recover this judgment by looking at another color. Most ladies probably do not know why they do it, but it is because of this nervous fatigue—the nerve gets tired and if we had 20 pieces all red the last one would look a dim red. Suppose we have a pure red striking on the eye, that pure red will nevertheless affect to a slight extent the next nerve, the green. Therefore what we call red is really diluted by green. Suppose before we look at that green we immerse the eye in a green light, and if immediately afterwards we look at a red it should look brighter.

Now to prove the fact. I have here a slide. The whole of this evidence depends decidedly on your agreement as to the first statement of the condition of the slide. There is a slide in which we have three pieces of red glass. Now I will tell you how they are made. You can agree or not afterwards, as you see fit. They were made out of a piece of this red glass, and are, therefore, the same color with the slight exception of a flicker of the light, there can be no difference in the intensity of the red. But moving this slide a little I interpose a green light. I will ask you to do what you did before—fix your attention on the middle of the green, which is, remember, on that same slide. We have a red which can be put back again. You will find, on the return of the red, that that red will look much more brilliant or darker than the top and bottom. I will keep it there a few minutes and then, when we go back to the original red, you see there is no doubt about it. Thus by tiring out the green nerve we can change the color of a thing. That is intelligible as far as it goes. As I said, I have three of these slides, and I will take another one. Here I have three pieces of glass which are yellow. The reasoning is the same in one sense, but the application is a little different in each case. Let us, therefore, consider what we are looking at. We are looking at a yellow glass. That yellow has no corresponding nerve in the eye; in other words, it affects the red and the green nerves, so that it is to the eye a mixture of red and green. Now, suppose we tired out the green nerve and came back to the yellow, that yellow would look a little more on the red side and should appear an orange. In order to look at that the better, to get the effect of it more steadily, look at the center of the green slide before I move it. Thus you see, step-by-step, there is no question at all that we can prove by experiments that these things are so, and it is an axiom in science that when we think a thing is so, and we prove it is so, it is so.

Lastly, I have a third slide in which I have three blue squares. Now we must consider a moment what we mean by blue. There is no blue nerve in the eye. There is a violet nerve and a green one and a red one, so that if we present a blue color to the eye we are affecting the green and the violet. If we tire out the green nerve, the blue will be a little less green and more voilet. I said to you a little while ago that violet is an elementary color. Therefore we ought to succeed in getting violet out of that blue. I now put in a green glass, keep it there long enough to get the tiring of the nerves of the eye, and we can go back here and form a very distinct violet color in place of the blue that we started with. (Illustrating.) (Applause.)

Now I feel, gentlemen, that I have put a

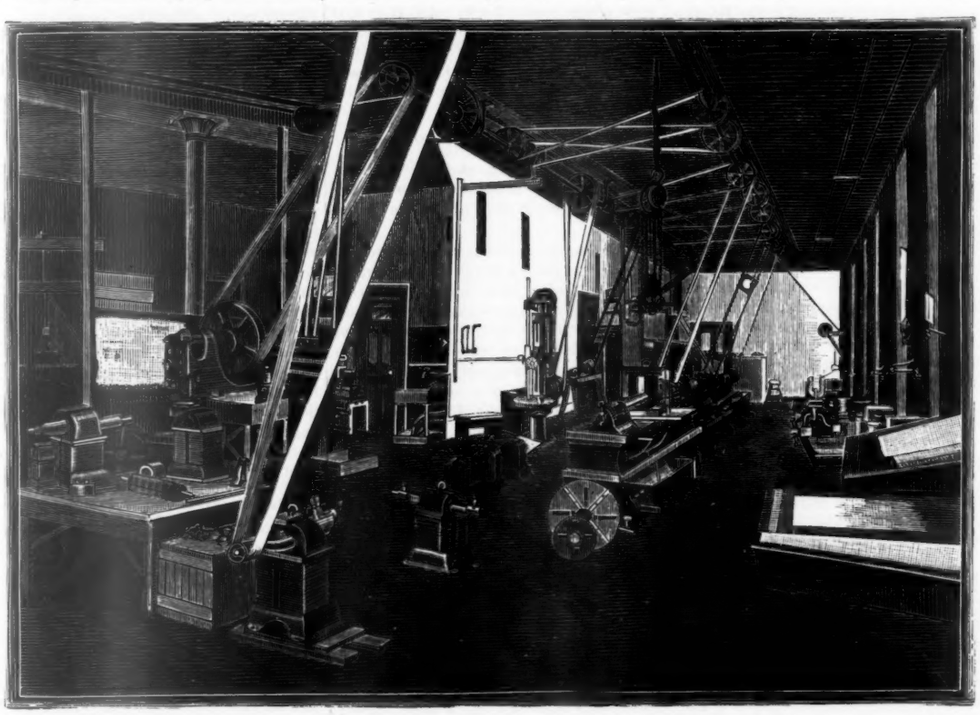

FIG. 2.—EXPERIMENTAL ROOM IN THE CONNECTICUT MOTOR COMPANY'S FACTORY, HARTFORD, CT. (See description, first page.)

see whether it agrees step by step with the theory that we have only these three nerves. I will begin with some general experiments. I shall have in this case to call on you for your evidence as to whether the result agrees with my statement. I will begin first of all by tiring all the nerves, and I will ask you to help me in this experiment as much as you can by doing one thing. It is very important if you want to get the result I want to prove to you, that while I am talking you keep your entire attention on a part of that disc, preferably the center of it, but no matter where. Constantly look at that spot. If you look at that spot the light will fall on a certain district of the retina and no other. These three nerves are supposed to be at every part of the retina, just as if we had a kind of three-wire cable. Now, taking that disc you must remember we have all the colors there. That part of the eye is tired, but the district of the eye which would take in the rest of the screen is fresh for the work. If I suddenly remove that screen and flood the screen with a whole disc of light, then the new screen should appear more brilliant than the disc, so that by this difference we should get a shadow where you see a beautiful bright disc.

Continue to look and you should see that disc loom up as a kind of a shadow, but not unless you look steadily at the same point all the time. (Applause.) Thus by tiring a certain district of the eye we can get a certain effect.

I designed these particular slides not so very long ago and as a rule I do not publish these results. I am rather a busy man and strain on you on the theoretic side quite considerably. I have brought all the facts that I thought necessary before you to-night to prove what I call the "three color nerve theory" of the eye, and I believe I have based it entirely upon experiments and not upon mathematics. I need not detain you any longer, except to thank you for the remarkable attention you have been good enough to give to my remarks.

Mr. Dutton: I move a vote of thanks be tendered to the Professor for his instructive and interesting lecture.

The motion was unanimously carried

Springfield, Ill.—A certificate was filed reducing the capital stock of the Cicero Water, Gas and Electric Light Company, from $200,000 to $100,000.

Baltimore, Md.—The South Atlantic Telegraph Company, of Baltimore City, has been incorporated, with a capital of $50,000. It is said to be a link in the Mackay-Bennett Post Telegraph and Cable Company's system.

Chicago, Ill.—Northwestern Street Railway Gas Motor Company, Chicago; capital stock, $5,000,000; for the manufacture of street car motors and motors for manufacturing and domestic purposes, and furnishing propelling power; incorporators, Francis A. Bates, Edward F. Getchell, Jefferson Hodgkins.

Port Townsend, W. T.—The Port Townsend trustees have granted a franchise for the motor road; the contracts have been let for two motors and cars.

Chester, S. C.—The Chester Electric Light and Power Company; Giles J. Patterson, John J. McLure, Wm. M. Nicholson and others; capital stock, $5,000.

Whitman, Mass.—The Whitman Electric Company; capital stock, $20,000; directors, D. A. Gurney, Albert Davis, C. D. Nash, H. F. Copeland and Samuel Elder.

Belleville, Ill.—The Citizens' Electric Company, at Belleville; capital stock, $100,000; to manufacture and supply light, heat and power; incorporators, S. W. Baird, S. P. Baird, and J. J. McDowell.

Chicago, Ill.—The Whitfield Manufacturing Company, at Chicago; capital stock, $5,000; for the manufacture of electric laryngoscopes; incorporators, G. W. Whitfield, T. C. Moore, and F. H. Scott.

Greenville, Miss.—The Delta Waterworks, Sewerage and Light Company; capital, $100,000, with the privilege to increase the same at the company's will. The stock was all taken, and it is the intention of the company to begin operations at once.

East St. Louis, Ill.—The American Motor Company, at East St. Louis; capital stock, $5,000,000; for the manufacture of motors and to deal in patent devices for the propagation of power; incorporators, T. J. Christy, F. C. Stewart, C. E. Carroll, L. E. Frost and E. H. Miller.

Chicago, Ill.—The South End Electric Light Company, at Chicago; capital stock, $30,000; for the purchase, sale, renting and furnishing of electric and other lights, lighting apparatus, power and machinery; incorporators, G. Falkenburg, F. D. Foster, J. H. Thompson and Frank Reidle.

Columbus, O.—The following articles of incorporation were filed with the Secretary of State: The Van Wert Gas Light Company, increase of capital stock from $25,000 to $37,000; change of name of the Massillon Schuyler Electric Light Company to the Massillon Electric Light Company.

Syracuse, N. Y.—The Dewey Manufacturing Company. The incorporators are: Emil Laass, Mark W. Dewey and Charles H. Duell. The corporation will manufacture and sell electrical appliances under letters patent to be issued to Mark W. Dewey. Capital stock is placed at $15,000, par value $100 per share.

Sandwich, Mass.—The Cape Cod Glass Company, of Sandwich; capital stock, $50,000, at $25 per share. The officers are: President, Charles W. Spurr, of Boston; general manager, Harry F. Spurr, of Sandwich. Glass is to be manufactured in all its branches at the works in Sandwich, and an office will soon be opened at Boston.

Buffalo, N. Y.—D. N. Long has devised a scheme by which he expects to drain the city of Buffalo and derive sufficient power from Niagara Falls to light the city by electricity and furnish power for 18 mills. The Buffalo and Niagara Water Power and Drainage Company has been organized to carry the scheme into effect, and the Legislature has been asked for a charter. The capital stock is $5,000,000.

Richmond, Va.—The Burton Electric Heater Company; capital stock is to be not less than $100,000 nor more than $2,000,000, divided into shares of $100 each. The principal office is to be in Richmond. The corporators are Messrs. W. E. Tanner, president; C. E. Wingo, vice-president and treasurer; Andrew Pizzini, R. B. Lee, William Simpkins, J. W. Kates, John Mahoney, W. Leigh Burton, W. P. de Saussere, L. B. Tatum, John Chamblin, James T. Gray, P. H. Mayo, R. G. Reynolds, Lewis Ginter, Thomas N. Page, and T. N. Carter.

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CHARLES W. PRICE, - Associate Editor.
T. J. McTIGHE, Electrician and Manager Patent Bureau.

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We invite correspondence from Electricians, Inventors, and the Telegragh and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

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Mr. J. F. Morrison, of Baltimore, was taken very ill shortly after his return from the Chicago Electric Light Convention, and for three weeks past his condition has been most critical. We are pleased to be able to state that a change for the better has occurred in the last few days, and he is now slowly regaining health and strength. If his physician decides he can be safely moved, Mr. Morrison will go to Atlantic City this week and remain during his convalescence.

The annual meeting of the American Bell Telephone Company will be held this week. Vice-President and General Manager John E. Hudson will probably be elected president to succeed Mr. Howard L. Stockton, resigned.

"When I said all the wires were to be put underground inside of 45 days I didn't know that the conduits would blow up"—*M-y-r Gr-nt.* There are a few other difficulties, esteemed Mayor, connected with this work that you are not familiar with—but we think you will learn.

If the Board of Electrical Control will consult electrician John P. Barrett, Chicago, they may get some information relating to the diffusion of gas in conduits that will be of great value to them—provided Mr. Barrett decides to come to the rescue like the good philanthropist he is.

Judge Coxe's decision in the secondary battery litigation is too long for us to present it in full, and we give our readers instead the statements of the parties interested with the important extracts, from which it can be seen that the decision is looked upon in a different light by each of them.

A page advertisement of the Westinghouse Electric Company appeared in the REVIEW last week without the name and address of the company. This was an oversight on our part as well as on the part of the company, who promptly corrected the advertisement, which appears in this issue on page 15, when their attention was called to it.

Competition is the main spring of business, and in a comparatively new industry this fact stands out, perhaps, but at the same time it is pleasant to note that honorable competition of a live and let live sort is that which generally exists in the electrical business, and a misfortune is condoned and met with sympathy with the idea that in the almost unlimited field there is room for all.

A process of engraving on glass and crystal by electricity has been communicated to the French Academy of Sciences by M. Plante. The plate to be engraved is covered with a concentrated solution of nitrate of potash, and put in connection with one of the poles in the battery, and the design is traced out with a fine platinum point connected to the other pole. The results are said to be of marvellous delicacy.

The gas companies are fast getting to realize that antagonism by them to the electric light is inimical to their own best interests, and there is a steady increase in the number of electric lighting plants which have been installed by them. They have nearly doubled in the past six months, and it is pretty conclusive that it pays a gas supply company to furnish electric light also to such patrons as may want it. Gas companies in this country are now supplying a total of over 21,000 arc and 55,000 incandescant lights to their patrons, in addition to the mephitic commodity they were originally organized to furnish.

The underground conduits at the corner of Fifth avenue and 23d street exploded Monday last, tearing up the street and scattering iron plates, bricks and cobblestones among the promenaders on this crowded thoroughfare. Fortunately no one was seriously injured. The explosion is supposed to have been caused by gas leaking into the conduits and manholes. The public, in time, will learn that the burial of the wires as proposed in New York is beset with difficulties of which they have but little conception. Speaking of this disastrous explosion, Commissioner Gibbons, of the Board of Electrical Control, is reported as saying:

"Inasmuch as no loss of life has resulted from this explosion, it is, perhaps, fortunate that it occurred before the electric current had been transmitted over the wires placed in the subways; for, if any of the conductors in the subways at the time of the explosion had been in operation, a new and serious question as to the practicability of operating electrical conductors underground would immediately have been raised."

THE ELECTRIC PLUMBER.

There are not 50 electric plumbers in existence, and very few people have ever heard of the term before, yet it is the name of a trade the members of which are well paid, and which in a few years will hold an important place among our industrial crafts. The electric plumber is the man who makes the joints in lead-covered wires and cables. He may be seen any fine day in the subways deftly shaping a pasty mass of solder into a "wipe joint" around a cable pipe, or skillfully twisting and connecting the wires of the cable itself.

The electric plumber is called upon to do not only some of the most difficult jobs in the plumbers' art, but must possess a good knowledge of electric circuits, and particularly of the insulation of such circuits. A competent plumber who has the required electrical skill is at present in great demand and can easily obtain profitable employment.

To this fact we call the attention of that large number of capable but discontented young men who find that their positions as linemen and inspectors for telephone and other companies do not afford them the desired opportunity for advancement. Our advice to such young men is to practice plumbing. Exchange the strap and vise for the fire-pot and soldering iron. Learn to make a wipe joint. Never mind if at first you do burn your fingers and make lop-sided joints. Persevere to the end, and you will become so valuable to your own company that you will not need to accept work with another.

THE ELECTRIC CURRENT.

Dr. J. A. Fleming, in his "Notes on Electro-Magnetic Induction," presents the following views on the action of the electric current:

"An electric current on this hypothesis is a flow or progression of the electric particles which are free to move forward in a conductor, and which only can move steadily forward, owing to their incompressibility, when the circuit in which they flow is a complete circuit. Suppose a thin conductor bent into the form of a very large circle, and that an electro-motive force urges a procession of electric particles around it. As these particles go forward they cause the electric *cells* next them to rotate, and the motion of this line of cells embracing the line of current will be just like that which would take place if a bracelet of spherical beads strung on an elastic thread were rolled along around a long rod which it closely embraces. Each bead would turn over and over, rolling on the rod, and the motion of the whole bracelet would be like that of a tightly-fitting india-rubber umbrella ring pushed along a round ruler. The progression of the electric particles would start circular vortex rings revolving round the line of motion. This corresponds to the fact that a linear current creates a magnetic field composed of circular embracing lines of forces. The first or adjacent line of vortices would, by the intervention of the idle wheels, set in rotation another set of cells lying on a concentric line, and cause them to rotate in the same manner as the first ones. Also, it would cause a backward displacement of the intermediate idle wheels, if we consider that only the central line of electric particles are conducting matter, and that the next and all succeeding rows are in a dielectric. The starting of the progressive movement of the line of electric particles in the conductor will result in an elastic displacement in the *opposite* direction of all surrounding electric particles in the dielectric along lines parallel to the line of current; and also in setting up a system of molecular vortices composed of revolving cells, the axes of these vortices being coaxial circles described round the line of flow, the rotations and displacements being propagated out laterally from the line of current. In consequence of the fact that the revolving cells are supposed to possess inertia or mass, and that all the mechanism is supposed to be rigidly connected together, a steady force applied to set the central line of electric particles in motion will not be able to produce in them the full velocity until time has elapsed sufficient to allow the inertia of the connected mechanism to be overcome. We are thus able mechanically to imitate the phenomena of *self-induction* of the circuit and the gradual rise of current strength in an inductive circuit under the operation of a steady impressed electro-motive force, and to deduce it as a consequence of the fundamental hypothesis."

HON. CHAS. E. MITCHELL, COMMISSIONER OF PATENTS.

The administration is to be congratulated on the part of the vast army of inventors, and especially on the part of the patent attorneys throughout the country, for the appointment, as Commissioner of Patents, of a lawyer whose reputation and experience as a patent attorney are widely and favorably known. It has been so long customary to give this office without regard to especial fitness, that a feeling of relief arises when we hear of the appointment of a patent lawyer, and the feeling is intensified by the fact that the new Commissioner will go into the office with many years active experience as a practitioner. He will therefore be thoroughly acquainted with the needs of the profession, and will be expected to make such revision of the rules of practice as have long been demanded. These rules have been amended and revised by every commissioner from time to time, and while some rules have been for the better, many have been the bane of the patent attorney's existence. It may be too soon to point these out in detail, but one of them is so pernicious in its possibilities and effects that it should and doubtless will receive prompt consideration from the new Commissioner, because he must have experienced its effects. We refer to the practice of withholding examination on the merits until all matters of form are cleared up. This rule has permitted the growth in the patent office of an autocracy which is intolerable. Happily many of the examiners do not carry the rule to its full extent, but some there are whose rigid adherence to the rule—and we do not doubt the probity of their motives—has the effect of hanging up a case beyond all reason and justice. An applicant pays for an examination of his claims, and he ought to have it at once, instead of a letter postponing action on the merits until a swarm of trivial and irrelevant objections to his papers have been complied with. This is not the fault of the examiners; the rule has been laid down and followed by one commissioner after the other with increasing severity, and the examiners have had little choice save in the manner. We will have more to say later on, but now wish only to congratulate the administration for a most admirable appointment.

Annual Meeting of the Electric Club.

The celebration of the third anniversary of the Electric Club and the holding of the annual election will occur on the third Thursday of next month, April 18th. The committee on entertainment, which is composed of Messrs. E. T. Gilliland, Leonard E. Curtis, Chas. W. Gould, Dr. Otto A. Moses and the secretary of the Club, are arranging a programme for the evening after the election, which will consist of music, recitations, dialogues, theatricals, etc., which will be almost exclusively presented by the members of the Club.

The Club's *cuisine* has become particularly popular, and the regular dinners given every Thursday night are largely patronized and highly complimented. A specially fine dinner will be prepared for the annual meeting, which will be served in the upstairs dining room.

The election will no doubt be the occasion of much friendly work, as the electrical people have a decided *penchant* for taking part in such occasions, as has been noticed at other Club meetings and electric light and telephone conventions. The ticket placed in nomination, which we publish in another column, will be printed and sent out to every member of the Club.

The United States Illumination Company of this city (the local lighting company) has been purchased by the Westinghouse Electric Company.

Mr. Geo. E. Voorhees, Jr., who is at the head of the electric light interests of Morristown, N. J., recently returned from Washington, D. C., where he visited the new electric road of the Eckington and Soldiers' Home Railway Company (T.-H. system), and is pronounced in his praise of the excellent workmanship and noticeable success of the road.

THE NEWS.

Interesting Electrical Information Sent in by our Correspondents.

OUR BOSTON LETTER.

New Construction and Equipment Firm.—Messrs. H. H. Cutter and H. E. Swift have formed a partnership for light electrical engineering work, giving special attention to the complete electrical equipment of houses, stores and offices. The new firm's headquarters will be at 34 School street.

Boston Visitors.—Dr Otto A. Moses, accompanied by his lawyer, Mr. Joseph Lyon, of Washington, has been in the city for several days engaged in taking testimony in relation to an interference of patents with the Thomson Electric Welding Company, on electric welding, Dr. Moses having applied for patents on electric welding processes in 1883. Mr. Lyon was one of the counsel in the Bell Telephone suits and is well known in Washington legal circles.

Eddy Motor Sales.—Messrs. Spaulding & Buck, general agents of the Eddy Electric Manufacturing Co.'s motors, have just sold a 10 horse-power motor to White & Brown, printers, at 41 North street, and one of two horse-power capacity to W. C. Cannon, also in the printing business, at 277 Washington street. In their pleasant offices in the Hathaway Building, Messrs. Spaulding & Buck have a display of Eddy motors in practical operation, running fans, etc., and a 50 light dynamo of the Continental pattern, for which, a so, they act as New England agents.

Dining Mr. Thurnauer.—A complimentary dinner to Mr. Ernst Thurnauer, of the Thomson-Houston International Electric Company, was given at Young's, Wednesday evening, by his friends and fellow workers in the company. After the dinner, which was an enjoyable affair, Mr. Thurnauer left for New York whence he sailed on Saturday for France where he will have charge of the exhibits of Prof. Thomson, the Thomson-Houston International Electric Company and the Thomson Electric Welding Company at the Paris Exposition.

Elevated Roads.—The feeling seems to be that the time is not far distant when elevated roads will cease to be simply matters of legislative investigation, and will become realities in Boston and its suburbs. The final assumption of corporate powers of the Meigs Elevated Railway Company, noted elsewhere, is considered evidence of something being actually accomplished, and the belief is gaining ground that at no distant date some of Boston's streets will be made use of for mid-air traffic, and electricity is sure to play a prominent part as a motive power when this takes place.

In Legislative Halls.—The question of allowing cities and towns to engage in municipal gas and electric lighting is receiving much attention at the State House this year. The petition of Danvers for such authority was the start, and the end certainly is not yet and cannot now be foretold. Another matter which will come up later is the increase of capital of the Bell Telephone Company, for which strong arguments will be made and some opposition probably encountered.

Important Conference.—At the Electric Club rooms on Wednesday last an important conference was held between the electrical construction people and those representing the insurance interests, in regard to formulating a set of rules to apply to the installation of electrical plants. Such conferences carried on in the spirit in which they are in Boston cannot fail to be of the greatest benefit to all concerned.

Prominent Visitors.—Among the callers at the Boston office of the REVIEW last week were: Mr. A. J. De Camp, of Philadelphia; Mr. M. E. Baird, of the Eddy Electric Manufacturing Company; Dr. A. De Bausset, of Chicago, whose air ship projects have met with so favorable a reception; Mr. M. M. Slattery; Mr. W. R. Kimball, the T.-H. Company's representative at Montreal, and Judge Taylor, the counsel of the Fort Wayne Jenney Company.

Meigs Elevated Road:—A charter has finally been taken out by the Meigs Elevated Railroad Company, the document being issued by the Secretary of State Friday afternoon. The charter names include Benjamin F. Butler, Joe V. Meigs, William A. Russell, Frank Jones and other prominent men. The certificate of capital stock paid in says it has been fixed at $200,000, not less than $100,000 for each mile to be erected in Cambridge, as a part of the road contemplated in the charter; that 10 per cent. of the stock has been paid in, and that it is intended in good faith to locate, construct, maintain and operate such railway upon a route fixed in the manner prescribed by law. The officers are as follows: J. H. O'Neil, president; F. E. Gregory, treasurer; B. F. Butler, Joe V. Meigs, Henry Dobbins, John P. Wyman, Jr., A. C. Drinkwater and W. S. Butler, directors.

Isolated Plant in the City Hall.—A hearing was given Friday by the committee on public buildings, on the question of placing an electric light plant in the City Hall basement, for the purpose of lighting that building, the court house and building occupied by the register of deeds. Several witnesses stated the probable cost and economy of such a step, and the matter was taken under advisement.

Boston, March 23. T. W. S.

OUR WASHINGTON LETTER.

Interior Electric Conduit.—Vice-president Morton's new $300,000 apartment house in Washington, D. C., is being fitted up by the Edison Interior Electric Conduit Company with an elaborate system of tubing according to a new plan made up of various inventions controlled by this company. The tubing is made of paper and some pitch compound, and is provided with elbows, connections, etc. The largest size used is about one inch in diameter. Double flexible conductors for incandescent lights are to be drawn into this tubing after the building is completed. One of the advantages claimed for this system is, that in case the wires should be fused by the current, the tubing will suffer no injury, and new wires can be readily drawn in at any time. An ingenious device is used for running a line into the tubes, which can be done through sections 180 feet long, with fine elbows. Mr. Geo. C. DuBois, who has charge of the work, understands that the Edison Company will adopt this conduit plan for all its work. This is the second building so equipped. Edwards & Company, 5 and 7 Dey street, are wiring the building for their teleseme call-bell system.

No New Wires in Washington.—The attorney of the District of Columbia, to whom the commissioners referred the law relating to electric wires in Washington, which was blundered through Congress just before adjournment, has decided that there is no authority for the construction of new lines by anybody. Not only can no new company run lines into the city, but existing companies cannot make any extension of their lines. This interpretation of the law will prevent the Spalding Long Distance Telegraph Company from getting the permit recently asked for. There is a question whether the Western Union and other telegraph companies which, by their acceptance of the terms of the Act of 1866, secured the right to build lines over any post routes, can be deprived of such rights by an amendment to an appropriation bill, but, inasmuch as this question, if raised, would go to the Supreme Court before any lines could be built, the subject will probably lay over till Congress meets, when the national legislators may try their hands at electrical science once more.

G. C. M.

Washington, March 23.

The Perret Motor in Demand.

The following recent orders for the Perret electric motor (manufactured by the Elektron Company, New York) should be specially pleasing to the inventor, as coming from persons of expert judgment:

One ½ h. p. motor to the physical laboratory of the University of Michigan, Ann Arbor, Michigan.

Two ½ h. p. motors to Stephen D. Field.

Two ½ h. p., and two ½ h. p. motors to Thomas A. Edison. These machines will be used to drive working models and light machinery in the large exhibit which Mr. Edison will make at the Paris Exposition.

Two ½ h. p. motors to the Postal Telegraph Company. One of these will be in use in Chicago, and one in N. Y. City, for driving the apparatus of the American Machine Telegraph system.

One 1 h. p. motor to the Western Electric Company, Chicago, Ill.

One ½ h. p. motor, 8,000 revolutions per minute, to American Bell Telephone Company, Boston.

One 2 h. p. motor for propelling torpedo boat in connection with Julien storage battery.

Annual Meeting of the American Medical Association.

This Association will meet at Newport, R. I., June 25, 26, 27 and 28, 1889. Dr. Chas. A. Brackett, of Newport, is chairman of the sub-committee on exhibits. A large attendance is anticipated.

Testing the Carbons.

The Burlington (Iowa) Electric Light and Power Company has given official notice that all the lamps in the system have been marked to ascertain the average life of the lamps—that is, the length of time the carbons will burn—and a request is made that no one will remove the slips placed on the lamps.

OUR CHICAGO LETTER.

A Sad Death.—Mrs. May H. Nate, wife of J. J. Nate, purchasing agent of the Chicago Telephone Company, for several days had been suffering from acute neuralgia of the stomach, and had been taking morphine and chloral to relieve her distress. On Monday evening, the 18th, about supper time, Mrs. Nate took the chloral bottle with her into the bathroom, and unwittingly swallowed an overdose, from which death resulted before a physician could reach her. Mrs. Nate leaves to her husband a single child, a girl of eight years. The bereaved ones have the earnest sympathy of a host of friends.

The Druggists as Lobbyists.—In many of the drug stores where there has been more or less cussing and discussing of the telephone rate bills, a blank petition, supported by pen and ink (stub pen and very black ink), lies on the counter mutely asking signatures. It was framed at the meeting of retail drug fellers the other day, and says: "Your petitioners respectfully represent that legislation protective of the business public from the excessive charges of telephone companies is urgently needed in all sections of the State. Believing that the measure known as the 'Eckhart-Baker' bill embodies reasonable and necessary limitations upon telephone charges, we beg to record our hearty endorsement thereof, and to express the hope of its enactment without amendment." These are all to be forwarded to Springfield on the 25th to the State Senate.

How it Looks.—The Chicago Company is getting all ready to run all its wires in metallic circuits—that is, it must just double the length of every subscriber's line and every trunk line of the service throughout the city, and that complicated, expensive method of switch board which has hardly got to working in the main central office has to be all overhauled. Then the outside district boards have each to be made to "consist" with the rest. The Bell Company of Boston, which holds 3,508 shares of the Chicago Company, will have to pay the lion's share of it.

Long Distance Lines.—These long distance, "far speaking" lines, which fly high in the air to keep away from the inductive influences of other lines, and are mounted on 40 feet poles—these, also, are quite expensive luxuries.

It Was for That.—It was to pay for these and similar extraordinary expenditures that the Bell Company, of Boston, asked to increase their capital stock, which the aforesaid druggists object to. It is hardly fair to think it was done to annoy the druggists of Illinois and the nine tailors of Tooley street.

The Opinion.—I talked with a retail druggist the other day, who freely stated his opinion on the situation. "As soon as all the parties down at Springfield," said he, "get all the boodle out of the companies they want, you'll see the whole thing drop." Whether he failed to get his crumb I don't know. Two weeks ago he would forget where he left off in putting up a prescription to abuse the telephone company. When it was raining porridge I think his dish was wrong side up.

Danger in Manholes.—The danger from carelessly entering the manholes of conduit, in a large city, before proper ventilation has purified the air, was well marked by a nearly fatal illustration on Washington street. Frank and Joseph Moffatt, two employés of the Chicago Arc Light and Power Company, were careless and came near suffocation by too hastily going down the manhole after removing the cover. Officer Clark rescued the men in a nearly exhausted condition. The locality has a particularly hard reputation for explosions—no less than half a dozen having taken place within a square either way from this one manhole, and it has a very uncomfortable way of going off, every now and again, itself. There have been two explosions close by it, within a week. The gas is presumed to come from a leak in the Washington or Lasalle street main, which creeps in somewhere through a crack in the conduit, or works in from some area or cellar, through an open duct. Having once entered the conduits, it works along until it rises in the manhole, being lighter than air. A few moments of waiting with the cover off serves to purify the atmosphere, and render the air in the manhole perfectly innocuous.

The long distance telephone people are nearly ready for business between Chicago and Milwaukee. Ten number twelve copper wires on forty feet poles will compose th route.

The Club.—The last meeting, 18th instant, of the Chicago Electric Club, showed a larger than average attendance. The occasion was an illustrated paper on handling electric light circuits, by Mr. George Cutter, of the Thomson-Houston Company. The circuit brought into the room carried a current for some 40 or 45 arc lamps, and the experimenter had arranged to use the current for his various experiments without interfering with that part of the commercial world depending on the current for light. As a pilot light Mr. Cutter placed a 65 candle-power incandescent in circuit, which would show if anything was going wrong on the outside.

Mr. Cutter made a strong point against the use of rubber gloves which he looks upon as a broken reed for reliance, because of a possible pin hole in the rubber at some point where a contact might be made unconsciously. He deems extra care and caution far better insulators for the hands and person than material insulators, while handling circuits. "Keep one hand in your pocket" is another of Mr. Cutter's requirements. He advocates a platform in front of the dynamo, insulated perfectly, on which to stand. A danger may arise from a watch chain coming in contact with the machine or line, or a second person may, by touching the dynamo-man or the trimmer, endanger his safety. The experiments of Mr. Cutter were of a brilliant and impressive character. Heating a wire stretched across the room showed how expansion changed the length, while cooling again restored its dimensions. This change in shape, though caloric, Mr. Cutter explained was due to the movements of the molecules of a body which we call a solid, and which we know is not a solid because of these very movements, which are mechanical. The shape of the arc was next shown by horizontal carbons. Various metals were burned in the arc, showing the different combustion hues, and long and short arcs illustrated. The effect of magnetism on the arc was shown, and pop-corn was roasted over an arc lighted gridiron. An arc was produced at the bottom of a jar of water. The action of magnetism at a distance, and the impossibility of blocking or baulking its progress by interposing diamagnetic substances, was well shown. Mr. Cutter's evening was a grand success in every respect. C. C. H.

Chicago, March 23, 1889.

PERSONAL.

Dr. Geo. H. Benjamin, the well-known electrical engineer, leaves for Europe this week, and will be absent some three months.

Mr. J. D. Bishop, of the Western Electric Company, Chicago, who will assist in preparing the telephone exhibit at the Paris Exposition, sailed for Paris last Saturday.

Mr. Ernst Thurnauer, chief engineer of the Thomson-Houston International Electric Company, Hamburg, is visiting the United States, and was a welcome caller on the REVIEW.

Sometimes it is difficult to draw the line with sufficient distinctness between the reformer and the crank.—*Toledo Bee.* Not at all. If he is on our side he is a reformer; if he's "agin us" he's a crank.—*T. B. D. of Conn.*

Mr. J. H. Reid, of Chicago, is receiving the congratulations of his friends over his marriage. Cards announcing this fact have recently been issued. The marriage occurred in Chicago, March 3d, Miss Lillias S. Smith being the bride.

Mr. Benjamin Rhodes, chairman of the Executive Committee of the National Electric Light Association, came down to New York from Niagara Falls, last week, and spent several days at the headquarters of the Association in this city.

Mr. W. D. Sargent, of Brooklyn, general manager of the New York and New Jersey Telephone Company, who will have entire charge of the United States telephone exhibit at the Paris Exposition, will sail for Paris April 13 on "La Gascoygne."

Col. Jasper N. Keller, looking 10 years younger, came over from Boston to attend the Electric Club meeting last week. As general manager of the New England Telephone and Telegraph Company he is perfectly at home and perfectly happy.

Mr. S. Sarbadhicary, a native of India, has issued an interesting account of his visit to the United States and of his work in telegraph circles in this country entitled "A Sojourn in the United States of America." The REVIEW has been complimented with copies of the book.

Mr. H. L. Shippy, manager of Jno. A. Roebling's Sons' Company, New York, returned last week from a two weeks' visit to his orange groves in Florida. There returned with him three pounds of additional flesh, an improved complexion, and a number of boxes of oranges, which his New York friends who tried them pronounced the finest they ever ate.

Telephonic News

⁂ Omaha, Neb., is discussing the advisability of adopting the Dorsett subway system.

⁂ Keene, N. H., has 241 telephones, said to be the largest number of instruments of any place of its population in the country. The population is about 7,000

⁂ The position of general superintendent has been abolished by the Missouri & Kansas Telephone Company. Mr. John R. Mulvane remains as president, and Mr. W. W. Smith is secretary and superintendent of the Kansas City division, and Mr. C. W. McDaniels superintendent of the rest of the territory.

⁂ The telephone bill introduced in the New York Assembly by Mr. Hamilton has been amended to apply to New York City only, and the fee has been fixed at $7 per month. This, it is predicted, will make possible the passage of the bill, which would otherwise have been defeated. It will be opposed as it is.

⁂ The directors of the Missouri and Kansas Telephone Company at their recent meeting discussed the bill now pending in the Missouri State Legislature reducing telephone rates to $48 a year, and the opinion prevailed that if the bill becomes a law it would be best for the company to cease doing business in Kansas City. No more orders for new telephones will be filled until the bill is acted upon.

⁂ The Committee on Mercantile Affairs, Boston, is considering the orders as to giving gratuitous telephone service to municipalities by telephone companies running their service through the territory of said municipalities; as to regulating the telephone rates; and as to providing that electric wires shall not be placed on buildings except by consent of the owners. They hadn't reached a decision when last heard from.

⁂ The Atlanta *Constitution* prints a set of rules how to "watch out" and prevent accidents from electric wires in the streets or dwellings. It adds: "Atlanta subscribers may rest easy about their telephones. Since the matter was agitated by the *Constitution*, about a month ago, the electric light company has put up about 12 miles of guard wire between the telephone wires and electric light wires, so that if the telephone wires should drop they would be caught by the dead wires, and would not touch the big wires below. The guard wires are large and strong—galvanized wire No. 6—as large as the largest telegraph wire."

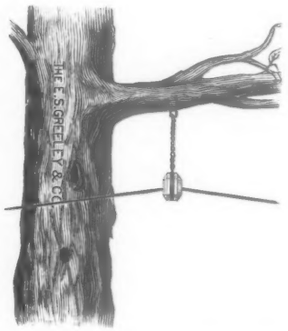
⁂ A bill has been recently passed in the Connecticut Senate which imposes a fine not to exceed $500 on any person who shall connect by wire or otherwise, with any telegraph or telephone wire, not owned or leased by such person, for the purpose of obtaining information or listening to the transmission of messages. The law was passed it is stated at the instigation of the telephone company, which was indignant at the tapping of the wire by the outraged husband in the recent Trowbridge-Ingersoll scandal case in New Haven a few months ago, thereby hearing the conversation between his wife and her admirer.

⁂ The telephone exchange, Burlington, Iowa, is to move into more desirable quarters in a few weeks. The *Hawkeye* of that city says:—The new quarters will be fitted up in a handsome manner and will be arranged in such a way as to accommodate the manager and his assistants in the most perfect manner. When this change is made the Iowa Union Telephone Company will be locally represented in a manner comporting with its dignity and importance. The man who seeks to send a message to some other town won't feel quite so much as though he were going to life-long imprisonment, in seeking the exchange, and the manager will feel something like holding up his head and putting on an agreeable amount of style.

Telephone Lines Rendered Useless by Angry People.

Up to two weeks ago one of the telephones of the Hudson River Telephone Company was maintained at West Berne, N. Y. The revenue was not sufficient to pay even the royalty on the instrument and the company notified the people that unless the amount of the royalty was turned into the company the instrument would be removed. The villagers objected to the removal of the instrument, and some threats were made that if it was taken away the wires of the company would be cut and the lines rendered useless. The villagers would not agree to make even the amount of the royalty up, and the instrument was removed. Monday night, the wires were cut, and about 100 feet carried off. A travelling agent notified the company, and it had to telegraph to Schoharie to have the wires replaced. By the cutting of the wires 25 places in Delaware, Schoharie and Jefferson counties are isolated. Detectives are hunting up the rascals, and report having a clue. The law provides that a person who wilfully or maliciously displaces, removes or injures, or destroys, a line of telegraph or telephone, or any part of it, etc., is punishable by two years in states prison.

⁂ The Woodward Underground Telephone & Telegraph Company is attracting some attention in Boston as a comprehensive underground system. As laid it consists of a wooden conduit 2½ by 3 inches, filled with a patented composition, imbedded in which are three wire cables, about half an inch apart. These cables supply 220 incandescent lamps in the court house and jail at Dedham, Mass., where an experimental plant has been put down, besides furnishing telephonic and telegraphic communication between the two points, and also working electric signal bells and the regulation fire alarm.



THE VICTOR INSULATOR USED WITH A VICTOR HANGER AS A "TREE INSULATOR."

The Duel of the Future.

Scene: At a telephone.

Ding-a-ling-a-ling.

First citizen: Hello, exchange; give me seventeen thousand and ten. Hello! is this seventeen thousand and ten? Is Blanky in? Tell him to step to the telephone, please. Is this Blanky? Well, I called you up, Mr. Blanky, to tell you that I know what you have been saying about me, and I wish to remark right here to your face that you are a liar.

Second citizen (at the other end of the wire): Under those circumstances I will be compelled to challenge you. Will name Gatling guns as weapons, and will request your attendance on the roof of the club house at 4.30 this afternoon. I will add, however, that you are much mistaken; I am not a liar.

First Citizen: Will you give me your word as a gentleman that you are not?

Second Citizen: I will.

First Citizen: Then, of course, I cannot do otherwise than accept the explanation and withdraw the challenge.

Second Citizen: That will be entirely satisfactory. Call around and see me when you get time. Good-by.

First Citizen: Good-by.

Ding-a-ling-a-ling.—*Merchants' Traveler.*

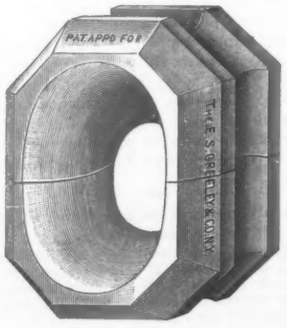
The Victor Split Insulator.

This departure in insulators is illustrated in this issue, showing its various applications. This insulator (manufactured by Greeley) has the especial merit of being provided with an opening to accommodate the largest wires, perfectly smooth bearing and locking lugs, that prevent any torsion of the two parts which may be bound together either by the insulator hanger or ordinary iron or copper line wire of a size adapted to the strength required for any given service, or as may be most convenient. Being in two parts they can be put upon a line already erected equally as well as upon a new one; and for taking up sag, and for guys and hauling off purposes, they are of undoubted value. They may be used to increase the capacity of cross arms by suspending them beneath. On elevated road structures and in tunnel work they are particularly useful. The ends of the hanger are long enough to encircle the insulator twice when they are simply twisted together as shown. The upper end or bearing of the hanger is provided with a stout smooth thimble that will withstand any abrasion, and which when hung on a hook, staple, or loop of wire, secures a practically universal joint admitting of free motion in all directions.

VICTOR INSULATOR HANGER APPLIED TO THE VICTOR SPLIT INSULATOR.

Fast Telegraphing.

The most remarkable time made in communicating by means of electricity with the Old World was that in the case of Hermann Muentefering, of Omaha, Neb., recently. At 1.30 in the morning he cabled Bonn, in Prussia. Returning to town after lunch, less than one hour and a half later, he found his message answered. In that time in round numbers, 10,000 miles had been traversed.

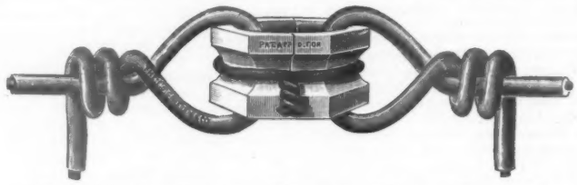


FULL SIZE CUT OF THE "VICTOR SPLIT INSULATOR."

English Postal Telegrams.

HOW MESSAGES ARE FORWARDED BY WIRE AND MAIL IN GREAT BRITAIN.

"There is a system of sending telegrams in use in England," said a Pittsburgh gentleman recently, "which might be of some practical advantage if adopted in this country. For example, a resident of any portion of the city, desiring to send a message by telegraph, writes it on a specially prepared blank and drops it into the nearest letter box. The letters are collected very frequently and all telegrams found in the box are taken to the nearest telegraph office and at once forwarded to their destination. Thus the telegraphic business is managed with a very small number of sub-offices, and there is little more delay than there would be if messengers were employed.



THE VICTOR INSULATOR USED SINGLY AS A "CIRCUIT BREAKER."

"Another and still better feature of the British telegraphic system is this: Suppose you are in the city and wish to send a telegram to some friend living in the country, it may be several miles from a telegraph office. You write your message on a blank and it is sent by telegraph to the station nearest your friend's residence. There it is put in the mail for immediate delivery, and the person to whom it is addressed receives it without incurring any extra expense, whereas, if the delivery were made by a telegraph messenger, the cost would be considerable. A message can be sent in this way several hours, and often a day, sooner than a letter could go by mail, while the expense is only that of an ordinary telegram. Of course they have special messengers for delivering telegrams when required, but the method I have described answers very well where no unusual haste is necessary."

USED WITH A VICTOR HANGER AS A "GUY" OR A "TAKE UP" ON A CONTINUOUS WIRE.

The Telegraph Suit.

The declaration of the Great North Western Telegraph Company, in its suit against the Montreal Telegraph Company for alleged breach of contract has been served. The action is taken under the lessor and lessees act, and is for $80,000, which the plaintiffs claim they are entitled to through the fault of the defendants, in not carrying out their contract. When the plaintiffs took over the business of the defendants they obtained privileges on the South Eastern, Credit Valley, Brockville and Ottawa, and Prescott and Ottawa railways. In 1886 the C. P. R. acquired possession of these lines and commenced a general telegraph business, greatly to the detriment of the plaintiffs, who claim that their business has been in consequence reduced by at least $40,000 a year. They paid the dividend of eight per cent. under protest, and now claim $80,000, being the loss sustained by them during two years. The defendants, although notified of the action of the C. P. R., refused to take proceedings, and must therefore be held responsible.

Wonders of the Telephone.

"Did you ever notice," said the pretty telephone girl to a Buffalo reporter, "what a difference there is in telephones. Actually they're as different as human beings. Some of them are excellent linguists, and others can't transmit a message in anything but American. Why, there's one instrument on my circuit, and if a Pole or a German rings up anybody and tries to speak his native tongue over the wire, the instrument simply refuses to work, and there's the awfullest time that ever was. But just let a good Yankee try it and it will transmit with astonishing clearness. Now, that's a fact."

The Watch Anatomized.

The average watch is composed of 175 different pieces, comprising upward of 2,400 separate and distinct operations in its manufacture. The balance has 18,000 beats or vibrations per hour, 12,060,080 in 30 days, 157,680,000 in one year; it travels $1\frac{48}{100}$ inches with each vibration, which is equal to $9\frac{1}{4}$ miles in 24 hours, $292\frac{1}{2}$ miles in 30 days, or $3,558\frac{3}{4}$ miles in one year.

Another Conduit Test.

The commissioners of Norfolk County gave permission last week to the Woodward Underground Telephone and Telegraph Co. to give a public exhibition of their patented conduit of electric light and other electric wires in Dedham, in order to show the system and its effective work both in the court house and county jail. At 4 30 o'clock, by special invitation, a large number of prominent citizens assembled in the basement of the court house, where telegraphing instruments, telephone, jail signal, fire gong and numerous incandescent lights were in position.

The current was turned on from the jail, and the basement was brilliant with the mellow halo of the electric light. The cables connecting the two institutions, the court house and jail, were laid by the Woodward Company last December, and include cables for 220 incandescent lamps, telephone, telegraph, electric signal bells and regulation fire alarms of copper wire No. 14, all operated at one time in a cable of $2\frac{1}{2}$x8 inches, without any interference from each other.

The conduit, when filled, is claimed to be impervious to water, decay or encroach of vermin, and has been in successful operation in Lynn.

*** The staff of the Missouri & Kansas Telephone Company gave a dinner to the retiring secretary and treasurer, Mr. C. D. Crandall, at Kansas City. Messrs. W. W. Smith, C. W. McDaniels, N. R. Furguson, J. W. Ebert and C. T. Carll were the givers of the dinner. Mr. Crandall has removed to Chicago, to go with the Western Electric Company.

*** Many of the subscribers of the Hudson River Telephone Company's service have "kicked" vigorously against an order issued two months ago by General Manager Uline, forbidding the use of a subscriber's instrument by others than the party or parties who pay for it. The company claimed that the order was only issued to protect the corporation, and because many subscribers had complained that their friends and neighbors, whom they did not wish to refuse, were constantly causing them annoyance by habitually using their telephones. The company had found that fully 40 per cent. of the calls sent to the central office came from non-subscribers. They made no objection to calls for doctors, police, fire department or a hospital ambulance, no matter who sent them in, but for other matters they established additional pay stations which the public were expected to use. But since many subscribers objected to such a rule, the company has agreed to a compromise which allows outsiders to send messages over the 'phones only through the medium of subscribers, who must do the talking for them. It is very probable that this plan, if adhered to, will effectually put the end to that great annoyance of all telephone companies—dead-head messages.

Present Age of the Earth.

The present age of the earth has been placed by Sir William Thomson at 100,000,000 years, while the speculations of others have given much larger figures. M. Adolphe d'Assier, who believes such estimates to be greatly exaggerated, considers the life of the earth in three periods, which he terms the igneous or nebula-stellar stadium, the stadium of solar illumination or organic life, and the stadium of darkness, cold and death. The first—which began with the detachment of the terrestrial nebula from the solar, and ended in the formation of the crystalline crust of the globe—he calculated, from physical laws, to have been 500,000 years in duration. The second—comprising the present epoch, and to close with the extinction of the sun, embracing the entire cycle of geological formations, is found by geological and physical evidence as likely to have a total length of 25,000,000 years, of which more than half have passed. The third stadium—starting from the end of solar illumination, and closing in the terrible and inevitable catastrophe of the earth to the sun, and momentarily brightened by the incandescence of the earth as the moon crashes into it, will have a length that cannot be calculated until the precise rate of acceleration of the motion of the earth around the center of attraction is known, but will probably be, at the lowest estimate, 100,000,000 years or more. Upon the whole, the present age of the earth appears to be about 16,000,000 years. This is but a small part of its existence, and everything leads to the belief that its total evolution through the immensity of space will exceed 1,000,000 centuries.

Electric Lights in Theatres.

It is probable that in a few weeks several theatres in Broadway will be lighted entirely by electricity. The attention of managers has been generally attracted to the successful work done by the Manhattan Electric Light Company at Proctor's Twenty-third Street Theatre. The Manhattan Company was the first to obey the law and get its wires into the subway conduits, and now finds itself in a position to take contracts for lighting theatres, which it could not do if it had to depend on overhead wires. The new Union Square Theatre will be lighted entirely by electricity supplied by this company.

An experiment is to be made soon at Daly's in illuminating the foyer says the N. Y. *Tribune*, and if this should prove satisfactory the system will be applied to the whole theatre. Probably Palmer's, the Star and the Bijou will also be fitted with the incandescent light. Theodore Moss, who plays the dual role of theatrical manager and Subway Commissioner, favors the project, and is glad to see the first company that obeyed the law reaping a reward. The advantage of the electric light in keeping the atmosphere cooler and purer than is possible where gas is used, is incontestable, and its general introduction will add materially to the comfort of theatre-goers.

What the Electrical Students at Cornell are Doing.

TO THE EDITOR OF ELECTRICAL REVIEW:

Prof. Nichols lectured February 15 to the Senior Electrical Engineering Association, in which he gave a very interesting account of his experience in Thos. Edison's laboratory while the incandescent lamp was being developed. Prof. Nichols is a very pleasing speaker, and always interests his hearers. Mr. Merrit and Mr. Nakano gave instructive accounts of their experiments on the relation of light given out to the energy put into the electric light, the former dealing with the incandescent, the latter with the arc lamp. Mr. Balch spoke concerning the method of testing dynamos as devised by Prof. Anthony for the Mather Company, and Mr. Snow gave a pleasing account of a line of tests made on the arc lights at Eau Claire, Wis.

A test was made at the Brush electric light station at Ithaca, N. Y., Friday, March 1, by the Electrical Engineers of Cornell University. F. C. P.

Ithaca, N, Y., March 12, '89.

A Large Electric Light Plant at St. Louis Electrical Exhibition.

A new electric light plant, by a company of which Mr. Charles Sutter is at the head, is announced for St. Louis. The *Republic* of that city says:

The Jenney and the New York Electrical Accumulator Co., whose respective systems will be brought into use, have already increased their capacities, and are now in a position to go to work immediately. It is claimed that the accumulative system, which is to be used, possesses merits of a superior order, because of the storage batteries for electricity, which will prevent any inconveniences that might otherwise arise from the breaking down of the machinery. The electricity thus stored will be sufficient to run the lights for seven hours without the aid of machinery, which would give ample time in which to repair any ordinary mishap.

The plant will be capable of maintaining 4,000 arc lights of 2,000 candle-power each, and 10,000 incandescent burners of the accumulator system. Of the 4,000 arc lights 2,226 will be used for lighting the streets, as stipulated in the contract, and 1,774 for private use in commercial buildings and elsewhere. Of the 10,000 incandescent lights more than 4,000 have already been disposed of, and the company say that they can give a light greatly superior to gas, and at an equal cost, still realizing a handsome profit.

In the construction of their lines over 300 miles of wire will be used, and negotiations are now pending to supply it. 20 miles of this will be placed in underground conduits, and the remainder strung upon poles. The arc lights will consume 3,000,000 carbons a year, which, at a cost of $10 per 1,000 will reach a cost of $30,000.

Their revenues from their contract with the city will be $166,439.50 a year, which, together with their receipts from private lighting, will bring them in about $300,000, from which they expect to realize a handsome profit.

The whole enterprise will be under the the superintendence of Mr. D. J. Harris, who is now consulting engineer and manager of the Accumulator Company. He has had an experience of 17 years as an electrician, during which time he has at different periods been in the employ of the governments of France, England, Germany and Italy, and he is regarded as one of the greatest of electrical engineers. Among other things, Mr. Harris is now completing arrangements for a universal electrical exhibition, to be held at the Exposition Hall in this city, commencing September 4th of the present year, which will continue for a period of six weeks. It is open to the entire world, and letters have already been sent out asking that those who may desire to participate will make application for space at once. The announcement has been made that no charge shall be made either for power required or space occupied to exhibitors whose application shall have been received prior to April 15. It will be the largest exhibit ever made, and will attract visitors from all quarters of the globe.

A New Use for Alternating Current.

A Swedish inventor has applied the alternating electric current to a commercial problem so successfully that its use bids fair to revolutionize the tanning industry both in this country and abroad. The process has been in successful operation in Sweden for 18 months, and an experimental plant has been established here to demonstrate its value, as the owners of the patents in this country are determined to verify all claimed for the process before its actual introduction. Patents are held in 17 different countries. By the process it is claimed that sole leather can be tanned in 800 hours by the application of an alternating current for one-eighth of the time, the old methods requiring six months.

... A few days ago the Western Union and the Gold & Stock Telegraph Companies, by order of the Chicago Board of Trade, disconnected their wires with the office of Charles S. Lee in the Board of Trade building, Kansas City, Mo., and were about to remove the ticker when Lee secured a temporary injunction. Judge Gibson of the Circuit Court afterwards rendered the injunction perpetual and ordered the wire connection to be resumed and the market reports to be furnished Lee as heretofore. Judge Gibson decided that the market reports of the Chicago and New York Boards of Trade were public property as far as dealers in grain and produce were concerned. This is the first decision in Missouri against the telegraph companies.

TELEGRAPHIC

.... The Essick "type writing telegraph" is attracting attention in telegraph circles.

.... The American District Messenger Co., of St. Louis, has been sold by the Bell Telephone Co. to the Mound City Messenger and Coupe Co. The American was the pioneer messenger company in the city, and was organized 14 years ago. It now has 500 boxes.

.... The Postal Telegraph Company has a gang of men at work in Iowa setting telegraph poles along the Chicago, St. Paul and Kansas City Railway track. They claim the Postal Company proposes to put two new copper telegraph wires from Chicago to St. Joseph, Mo., along the line of the road.

.... Telegraphic communication with the United States has been established by cable from Santiago de Cuba to Hayti and San Domingo; thence to the Island of Curacoa, thence to La Guayra and Caracas, Venezuela, where connection is made with the Government land lines for places in the interior.

.... The Washington & New Orleans, Telegraph Company has elected directors as follows: Norvin Green, president; R. H. Rochester, secretary and treasurer; W. H. Abel, trustee; Russell Sage, Thomas T. Eckert, Edwin Gould, Geo. J. Gould, John Vanhorne and J. B. Van Every, directors. The only change in the board this year is Mr. Jay Gould, who is replaced by his son, Edwin Gould.

.... Where a telegraph company's contract provided that the company would not be liable unless the claim for damages was presented within "60 days after sending the message," the Supreme Court of Indiana held (Western Union Telegraph Company *vs.* Yopst), that the provision had application only in cases where the message was sent, and that failure to present a claim within the prescribed time would not defeat an action for the non-transmission of a message.

.... The second annual meeting of the Holmes Electric Protection Company, of Toronto (Limited), was held recently. The following officers were elected for the ensuing year: A. R. Riches, president; W. J. Turpin, vice president; B. Jennings, treasurer; A. S. Wigmore, secretary; T. G. Blackstock, Jno. B. Wood and A. J. Patterson, committee. The reports indicated a gradual extension of the system of electric protection, showing that this method is steadily growing in public favor. Since its introduction there some four years ago 17 of the largest banks and jewelery houses have adopted the protection, while the system of patrol watchmen and signal service extends over the greater portion of the thickly populated district.

.... Portland, Oregon, wants a police signal system put in. Chief of the police, Parrist, says:—"Portland is growing so rapidly that we are kept moving to cover it. If we had an alarm system, the work of the police would be greatly facilitated, and I am sure the city would be afforded better protection. An officer who makes an arrest in the extreme northern end of the city at night is called off his beat from an hour to an hour and a half; in the day time he does not lose so much time, because he can readily hire an express wagon or convey his prisoner to jail on a street car. Now if some sharp burglars wished to pursue their work without fear of police molestation, all they would have to do would be for one of them to get boisterously drunk, get arrested, and that is all that would be seen of the officer for an hour and a half."

** Work has commenced upon the Beverly and Danvers electric railway route. All of the contracts have been made and the cars will be ready by the time the rails are, about July 1. The Weston motor will be used.

* * The Street Car Company, of Decatur, Ala., contemplate using electric motive power.

* * Woonsocket, R. I., has given permission for the introduction of an electric railway, overhead system.

* * The Street Car Company, of Charleston, S. C., Jno. Riggs, president, contemplate adopting electricity for their roads.

* * It is estimated that there are about 1,000 electric motors at work in Great Britain, while in America there are about 6,000.

* * A new street car line is projected from Watertown to Waltham, for which electricity will undoubtedly be the motive power.

* * David Robison, Jr., has been granted a franchise for right of way in a number of streets of Toledo, on which to build an electric railway.

* * Work has commenced on changing the motive power of the City Railway Company's cars from horse to electric power at Richmond, Va.

* * The cars for the London (Eng.) underground electric railway will have incandescent lamps; electric fans will be used to secure ventilation.

* * An electric railway is to be constructed at the popular summer resort, Mt. Desert, Me. It is to be completed next season, and will be nearly eight miles in length.

* * The East side Street Railway Company and the Buffalo Street Railway Company, of Buffalo, N. Y., have been granted the right to use the overhead electric power system in sections of the road.

* * The United States Motor Company has been organized at Kittery, Me., with a capital stock of $200,000; president, John M. French, Chelsea, Mass.; treasurer, Charles H. Reed, Boston, Mass.; directors, John M. French, Charles H. Reed, George A. Walker.

* * The stockholders of the Newport Horse R. R. Co. have voted to increase the capital stock from $50,000 to $75,000 to meet the increased cost caused by the use of electric motor power. The directors authorized contracts for cars and for building the road immediately. Work will be begun April 1.

* * The long fight between the Electric Light Co. and the Gas Co. for the contract to light the streets of the borough of Norwalk by electric lights was decided recently. The town house was densely packed by a throng of interested voters, who, at the close of a heated debate, decided for the electric company by an overwhelming majority.

* * The Sprague Company have closed a contract for a street railway equipment in Wichita, Kansas, where 7½ miles and four cars will soon be running by electricity upon this system. There is also another railroad running upon a different electrical system in Wichita. The improved 15 horse-power motors will be used and the equipment will be first class in every respect.

* * Another street railway to adopt electricity as a motive power for their cars is the electric railway company of Eau Claire, Wis. We are informed by the Sprague Company that this contract calls for the furnishing of six cars over five miles of track. The regular Sprague overhead system will be used, using a small No. 6 wire as a working conductor, no larger than an ordinary telephone wire, which is the only wire suspended over the track.

Central Station Lighting.

In a recent London lecture, Prof. Geo. Forbes presented the following interesting matter:

SPEED OF ALTERNATIONS.

"Now I come to a very important point. What speed of alternations shall we use? In Rome they have 83 alternations, or 41 complete periods, per second. In America, the Westinghouse Company have 267 alternations, or 133 periods, per second. What are the advantages and disadvantages, and why have these makers adopted different plans? I will answer this in detail to the best of my ability. First, Westinghouse went to rapid alternations because he wanted his converters to be of reasonable size. Second, he wanted to economise plant by using high speeds, and it would be very difficult to have slow alternations with high speed. Third, Ganz & Co. (Zipernowski) wanted to drive their machines at slow speeds, under which circumstances they cannot easily get rapid alternations. This is how these things were arrived at. Now let us see what the results are.

"1. With rapid alternations the size and cost of the converters is diminished. Most people seem to think this is a small matter. A moment's consideration shows that it is not so. It is found that in most houses the size of converter does not exactly fit the number of lamps, so a size larger must be used. Hence, for a 7,500 light plant converters for 10,000 lights are required. The price of these, for the sizes used in houses, is (as the average of many makers) £5,000. The cost of engines and dynamos combined (Parsons) for the same would be about £6,000. You will now see that the cost of converters is as important as anything else.

"Mr. Kapp has stated, I venture to think erroneously, that the size does not vary with the speed of alterations. This is opposed alike to experience and theory. Westinghouse knows this. I am informed that Mr. Ferranti knows it, and Mr. Zipernowski has told me so in a recent letter.

"2. There is, however, an important gain by slowing the alterations. It is then easier to work in parallel. This is due to the fact that the machines have more time to get into step. If I considered parallel working essential to success, I should say, 'sacrifice the cost of converters, and use slow speed.' Otherwise I should say, certainly and without hesitation. 'Use rapid alterations to increase the efficiency and economy.'

WORKING IN PARALLEL.

"The experience of Rome is encouraging to anyone who thinks parallel working essential. For my part I do not. Sub-division of mains is far more practical in most cases, and enables you easily to cut out special districts if a fire or other trouble occurs. It also gets over the trouble of increased resistance in large conductors with alternating current, dwelt on by our President in his opening address. If I have more than one station in a town, and I want one to assist the other, I would do so by trunk lines between the stations, to which a dynamo can be attached at one end and feeders at the other. Of course both stations must supply the same type of converters; hence in such a system it would not do to use dynamos of various speeds of alternations at the different stations. I would certainly prefer parallel working as being simpler for the men at the central station, if no complications are introduced to make the machines work in parallel, and if the system were equally economical, but I do not consider it at all essential. I venture to think, however, that the plan now universally proposed for making machines work in parallel will not long be tolerated. This is to introduce into the machine a large amount of injurious self-induction, thus diminishing the plant efficiency and rendering the equalising of pressure with varying loads very difficult. I have confidence in the ingenuity of our inventors, who will soon devise a less objectionable plan.

AUTOMATIC OR HEAD REGULATION.

"The question now arises whether the regulation of potential should be accomplished by hand or automatically. In all low-pressure systems, such as Berlin, it is done by hand. A workman soon gets to know at what hour special attention must be paid to this, and on the low tension system with shunt-wound or compound-wound machines the regulation required is slight. Where the saving in attention is not very great it is always unadvisable to trust to automatic dodges. The case of alternating-current dynamos with high self-induction is very different, for the electric pressure then varies enormously with the current. In this connection such a machine resembles a series-wound direct current machine with high resistance. The changes are so great that some automatic adjustment is necessary. Ferranti, Lowrie and others have used the sagging of wire to effect this, and they regulate the pressure at the dynamo, not at the centres of distribution, which is wrong. The apparatus looks too delicate for an engine room. But Ganz and Co. use a very practical type. They also regulate for the centres of distribution. I also prefer the method used by Ganz and Co. of regulating large changes by hand, and only the smaller changes automatically. This is necessary, owing to the very large adjustment necessary with alternators of high self-induction.

"In conclusion, I feel confident that all those who are working to maintain England's supremacy in this department of industry will agree with me that the practical details necessary for successful central station working must be thoroughly well thought out beforehand, and that much saving of time and money can be effected by gathering hints from those who have spent years of time and tens of thousands of pounds on these details.

"I frankly admit that I have learnt more that is of practical value in this line from the inspection of actual work done than by reading books.

"But we must remember that the low price of gas in England, the cheapness of coal, and the relative cost of labor, all introduce special factors which will partially differentiate the English practice either from that of the continent of Europe or of America.

"I wish now that the last words of this paper may be words of thanks to the gentlemen in other countries—whether in Europe or America—who have the control of central stations, for the courtesy which they have extended to me in my endeavors to assist, to the feeble extent possible to me, in maintaining the position of this country in the progress of this new and important industry."

Spontaneous Explosions Occurring During the Electrolysis of Acidulated Water by Means of an Alternating Current.

It has always been observed that when water is electrolysed by means of an alternate current, the mixed gases in the voltameter explode sooner or later. De la Rive, who noticed the phenomenon, attributed it to the catalytic action of the platinum black which he saw formed on his platinum electrodes. Bertin attributed the explosions to the polarization of the electrodes.

During the experiments referred to in the preceding abstracts these explosions were a constant source of trouble to the authors. They therefore carefully investigated the phenomenon, with a view to its prevention. Their results show conclusively that the explosion of the mixed gases is brought about by the platinum electrodes becoming heated to such a point as to determine the recombination of the dissociated elements. This heating is due to three causes, all of which depend ultimately on the gradual descent of the level of the electrolyte in the voltameter, thus leaving more and more of the electrodes in contact with the gases. Firstly, owing to the smaller surface of the electrodes, the current density is increased; secondly, the surface resistance is increased; thirdly, the cooling action of the electrolyte is decreased. It becomes, therefore, easy to prevent the explosion by taking due precautions to guard against the heating of the electrodes.—*Comtes Rendus.*

* * The Thomson-Houston Electric Company will equip the electric railway between Rochester and Charlotte, N. Y. The road will have 16 cars.

A Statement from Gen'l Manager Bates of the Electrical Accumulator Company.

TO THE EDITOR OF ELECTRICAL REVIEW:

The several published statements of the Julien Company regarding Judge Coxe's recent decision in the case of the Electrical Accumulator Company *vs.* the Julien Electric Company and William Bracken, seem to vary considerably from the actual facts in the case, as shown by a reference to the text of the decision itself, from which the following quotations bearing upon the chief questions at issue are taken:

"It, therefore, becomes apparent that the combination of the first claim, construed as it must be construed under the loose and inaccurate language of the specification, is anticipated in every form in which the active layer can be applied, save one, namely, in the form of a paste, paint or cement. The question now to be considered is, can the patent be saved to this extent? The application in the form of a paint, paste or cement was the real invention which Faure made. It was in this form that he gave it practical embodiment; it was this that the scientific world understood to be his improvement. An electrode for a secondary battery with the active layer applied in this form has many undoubted advantages over an electrode otherwise coated. It can be applied more evenly; it more readily adheres to the support; it does not shift its position; it will also pack more closely and readily, and make an adherent layer from which air can be thoroughly excluded so that uniform contact with the plate and throughout the mass of applied material is secured,' and finally a greater and less expensive storage capacity can be obtained.

"There can be little question, upon this proof, that Faure made his discovery as early as August, 1878. Scientific people at once recognized the progressive step taken, and to him was recorded the credit of an invention of extraordinary merit.

"Sir William Thompson says: 'I knew the Plante secondary battery prior to 1880. Faure's invention was a great improvement on it, so great as to produce a valuable apparatus for a large practical work instead of merely an interesting and instructive scientific instrument, which Plante's secondary battery was'"

* * * * * * * *

"The inventor himself says of his earliest experiments: 'I took two plates of lead about two and a half inches wide, covered each plate on one side with a paste of litharge, * * I do not claim to have invented spongy lead, but I boast of being the first that produced it in large quantity on the electrode of a battery, and the first to recognize it as an efficient element of a secondary battery.'

"It is, then, established with reasonable certainty that the discovery of a mechanically applied layer of lead, or like substance insoluble in the electrolyte and placed upon the supports in the form of a paste, paint or cement prior to their immersion in the battery fluid, so as instantly to become porous and capable of receiving and discharging electricity, was one of great merit. There is no doubt either that Faure was the first to make this discovery. Can he hold the fruits of his genius, or must the court decide that in attempting through mistake or ignorance of what had previously been accomplished, to grasp more than he was fairly entitled to, he has lost what actually belonged to him? Believing that Faure is an inventor of more than usual merit, it can readily be inferred that the court enters upon this inquiry with every disposition to give him the benefit of his actual invention, if possible to do so under the law."

* * * * * * * *

"It follows, therefore, that the complainant, upon filing a disclaimer, limiting the first claim of the Faure patent to an electrode of a secondary battery to which the active layer is applied in the form of a paint, paste or cement, insoluble in the electrolytic liquid, is entitled to a decree for an injunction and an accounting upon the claim as thus limited, but without costs."

Yours truly,

D. H. BATES,

Vice-Pres't and Gen'l Manager.

The Secondary Battery Decision.

OPINIONS OF THE OFFICIALS OF THE COMPANIES INVOLVED—DIFFERENT VIEWS OF THE DECISION.

Last week Judge Coxe, of the U.S. Circuit Court for the Southern District of New York, handed down his decision in the celebrated case of The Electrical Accumulator Company *vs.* The Julien Electric Company. The decision is very elaborate and evidences profound study on the part of the Court.

As it is a matter of great interest to all our readers, we give below brief statements made by the officials of the different companies interested in the questions involved, and it will be seen that their views are rather divergent.

THE JULIEN COMPANY.

The Julien Electric Company has the following to say, after dissecting the opinion of the Court:

"The decision concludes with the following language:

"'It follows, therefore, that the complainants, upon filing a disclaimer, limiting the first claim of the Faure patent to an electrode of a secondary battery to which the active layer is applied in the form of a paint, paste or cement, insoluble in the electrolytic liquid, are entitled to a decree for an injunction and an accounting upon the claim as thus limited, but without costs.'

"It will appear from the opinion, that no decree has been awarded to the complainants for any relief whatever, nor has any one of the patents been sustained; but on the contrary every claim in controversy is decided to be invalid (except one which is held not to be infringed).

"The Court has merely given leave to the Accumulator Company to file in the office of the Commissioner of Patents a disclaimer limiting the first claim of Faure's patent in the manner specified, and decided that, if this condition be complied with, the complainants may have a decree for an injunction restraining infringement of this claim, thus narrowly limited.

"The filing of such a disclaimer will operate as a complete abandonment of Faure's chief pretensions and will limit his patent to a device which the Julien Company does not use and does not desire to use.

"The Julien Electric Company does *not* apply the active layer in the form of a paint, paste or cement, but in a wholly different way."

THE BRUSH COMPANY.

The following are the views of Messrs. Witter & Kenyon, counsel for the Brush Electric Company of Cleveland:

"In 1886 the United States Patent Office rendered a decision holding Charles F. Brush to be the first inventor of the modern form of secondary batteries in which the active coating was applied mechanjcally to the electrodes, and as a result of this decis. ion patents were issued to Brush covering such secondary batteries.

"The Electrical Accumulator Company contended that a secondary battery, with a mechanically applied coating was first invented by Faure, and that the patent to Faure for this invention was valid, and was being infringed by the Julien Electric Company. The latter contended that the Faure patent was invalid because the invention was first made by Brush, as well as for other reasons. A large amount of testimony was taken in the case to show that Brush was the first inventor under the law, and the Court, after carefully considering this testimony, holds that such is the fact, and that Faure is not entitled to the broad claim for this invention.

"Two Swan patents, involved in the suit, were declared invalid. The remaining patent, that of Faure, had two claims which were in controversy in the suit. One of these claims was held to be invalid, if broad enough to be infringed; and the other was held to be invalid in its present form. The Court said, in reference to this last claim, that if the Electrical Accumulator Company would file a disclaimer, limiting its claim to one particular manner of applying the active coating, to wit, in the form of a paint, paste or cement, such a claim would be sustained. As all these patents were thus held invalid, no costs were allowed the complainant.

"The decision is one of great importance, as Judge Coxe, in a most thorough and convincing way, has considered and discussed the most important of the immense number of prior patents and publications which the defendant relied upon as anticipating this invention, and has ruled that none of these prior matters show a secondary battery in which the active coating is mechanically applied, and that Brush was the first one to reach this invention.

"It seems to be the necessary conclusion from this decision that to Brush belongs the broad claim to such a secondary battery, while to Faure belongs the restricted claim to the particular form of a paint, paste or cement, which, however, will be subject to the former claim of Brush."

THE ELECTRICAL ACCUMULATOR COMPANY.

Vice-President Bates, of the Electrical Accumulator Company, sends us the following for publication:

"Judge Coxe has just rendered a decision in the United States Circuit Court for the Southern District of New York sustaining the Faure patent for improvements in secondary batteries or accumulators. The patent is held to cover and control the manufacture, use or sale of any secondary battery in which an electrode is used having the so-called active material applied in the form of a paint, paste or cement, which is the only method yet known of constructing a practically operative secondary battery.

"The suit is entitled the Electrical Accumulator Company *vs.* Julien Electric Company, and the complainant is entitled to an injunction which will now be taken.

"With the exception of the recent decision of the U. S. Court for the District of Massachusetts sustaining the Thomson-Houston patent for an arc light current regulating device, the Faure patent above alluded to is the only electrical apparatus patent pertaining to lighting or motor business, the litigation on which has terminated favorably to the claims of the patentees.

"The field for accumulators is very large, as shown by the fact that there are to-day no less than eight or ten companies engaged in that business; among them are:

"The Electrical Accumulator Company, owning the Faure patents, and the Julien, Gibson, Woodward, Pumpelly and Macraeon Companies, all of whose batteries are tributary to the Faure invention.

"In anticipation of a favorable decision the Electrical Accumulator Company has already built a street car to be propelled by means of batteries, and now has it on exhibition on Elkins & Widener's Philadelphia Traction Road in West Philadelphia.

"Its initial trip last Friday was a great success, the car moving up a long five per cent. grade at the rate of seven miles an hour.

"Brill & Co., West Philadelphia, are making six other cars to be completed in April and May, and the Electrical Accumulator Co., believing that it controls the use of secondary batteries in all known practical forms, is now prepared to occupy extensively the Electric Street Car field."

New Work by the Hawkeye Electric Company.

The large establishment of J. B. Clow & Son, in Chicago, has been furnished with a two hundred lamp incandescent plant of the new Thorne system manufactured by the Hawkeye Electrical Manufacturing Company, of Davenport, Iowa. The plant was installed by W. M. Talcott, No. 117 Dearborn street, Chicago. The dynamo is automatic in its regulation and requires no attention whatever. A number of the lamps may be cut on or off at will. Mr. Talcott has sold two other plants in Chicago which will be put in at once as well as several motors. The Hawkeye company, since their removal to Davenport, from Oskaloosa, on February 23d last, have been running night and day, but are still far behind their orders.

—— At South Pittsburg, A. C. Green, representing the Jenney Electric Light Co., of Fort Wayne, Ind., is organizing a company to erect a plant.

—— The description of the lighting of the inaugural ball, which appeared in the REVIEW, was a deserved compliment to the enterprise of the Thomson-Houston Company and the officials in charge of the work. The description has been issued in slip form, the demand for the REVIEW that week (for this and other valuable contents) exhausting a large edition.

—— State Assessor James L. Williams has been appointed receiver of the American Electric Manufacturing Company. The company has a capital of $3,000,000, upon which it formerly paid dividends of six per cent. per annum. The difficulties of the company were carried into the courts some two months ago by the attorney-general at the suggestion of J. W. Hinkley.

—— The appropriation at New Haven for 1889 provided for only 11 new electric lights. The committee of last year recommended three new lights, and the present committee has voted in favor of two, so that only six more can be set. The demand for the electric light for street illumination is increasing, and an effort will be made to secure sufficient appropriation next year to provide a large number of new lights.

—— A despatch from Nashville, Tenn., says: Mr. Wheaton, representative of the Thomson-Houston Electric Company, has assigned his bid for furnishing the city with electric lights at 23 cents each per night, to the Capital Electric Company, recently organized here. Dr. T. A. Atchison, president of the latter company, then formally accepted before the board of public works and affairs the franchise recently granted the company by the city council, made the required bond of $20,000, and signed the contract to furnish the city with lights at the price named for three years.

—— In Manchester, Conn., at the last annual meeting of the Mather Electric Company, a plan for the formation of a new company to co-operate with the Mather was entered into. The new company will be known as the Perkins Electric Lamp Company, and will have a capital of $50,000. They will begin business very soon, and will furnish lamps not only to the Mather Company, but to other outside concerns. The lamp company will occupy nearly the entire upper floor of the factory at Manchester, and will give employment to a large number of hands.

—— A. L. Ide & Son have received a ten year contract for lighting the streets of Springfield, Ill., with arc lights of 2,000 candle power, at $137 per year for each light. In connection with this contract they have agreed to furnish incandescent lights for commercial use at a price not to exceed the cost of gas of equal illuminating power at $1.50 per thousand feet. Also to furnish current for electric motors from one eighth to ten horse power, within 2,000 feet of their station, at a cost not to exceed $100 per year for each horse power for ten hours use per day. They will erect a new station of sufficient size to enable them to operate the street railways, of which Mr. Ide is president, by electricity.

—— An electric light plant is to be placed on board of the Chapin Mining Company's steamer, "Progress," Milwaukee. Also an ore-trimming machine, that will be operated in a manner similar to the steam grain shovels and effect a considerable saving in expense. This is the first attempt at introduction of anything of the kind on ore-carrying steamers, and its operation will therefore be watched with a great deal of interest. Should the device accomplish the desired object, its introduction must speedily become general. The idea originated with Capt. Travers, of the "Progress," who has obtained a patent for the device. The electric light is to be utilized more particularly for loading and unloading, for which purpose it will prove invaluable.

ELECTRIC LIGHT NEWS

—— A Thomson-Houston incandescent plant is talked of at Danvers, Mass.

—— Hackensack, N. J., is advertising for bids for electric lighting. Good for Hackensack!

—— There are over 2,000 incandescent lamps in use in the enterprising city of Omaha, Neb.

—— The Woonsocket Electric Light Company has voted to double its capital stock, making it $200,000.

—— The Thomson-Houston Company has been given permission to erect an electric light plant in Griffin, Ga.

—— The Tiffin, Ohio, arc and incandescent electric light companies are said to be at war over the question of insulated wires, the latter company having used bare wire for years.

—— The Silvey Electric Light Company has taken the contract for building an electric light plant for the town of Bowling Green, Ohio. The price is understood to be $30,000.

—— Stock is nearly all taken for the Holley Electric Company, at Holley, N. Y., and the prospects are good for the speedy introduction of electric lights in the streets and business places.

—— The council has granted to the Martin's Ferry (Ohio) Construction Company the right to light the city with electricity, to furnish 25-candle power lamps at $20 per annum, and arc lamps at $90.

—— The Keystone Construction Company has received the contract for lighting the new building of the Fidelity Title and Trust Company, on Fourth Avenue, Pittsburgh. There will be 600 incandescent lights put in the building.

—— The new town clock of Norristown, Pa., is to be lighted by electricity; four incandescent lamps being used. It is estimated that the dials and the positions of the hands can be distinguished nearly as far by night as by day.

—— The Brush Electric Light and Power Company, the central station company of Cleveland, Ohio, has issued bonds for the purpose of increasing its plants, the bonds to the amount of $19,500 being taken by the parent Brush Company at Cleveland.

—— The La Crosse, Wis., and local Brush electric plant have consolidated their interests, and a new strong company will be formed. These concerns with the La Crosse Edison have very fine plants, whose combined value amounts well toward $500,000.

—— The Edison Electric Light Co. closed a contract through its agent, F. R. Stewart, for an electric light station at Piedmont, W. Va. The contract price for a 20 arc light plant and 500 16-candle power incandescent plant is $12,000. It will be established inside of 90 days.

—— A contract has been made with the Camden (N. J.) Electric Light Company to light the passenger station, freight yard and freight stations of the Pennsylvania system in Camden with the arc light. It is said the incandescent system is to be introduced into the railroad building at the foot of Federal street.

—— Mayor John H. Payne, H. C. Sweeney, controller, and Councilman H. F. Taylor, James S. Lewis, W. Dwyer, S. S. Culbertson, D. Lindersmith and W. H. H. Berry, Oil City, Pa., have about concluded to adopt electric light for its streets instead of natural gas, and are investigating the different systems.

MANUFACTURING NOTES.

The National Electric Manufacturing Company, of Eau Claire, Wisconsin, has opened a Chicago office in the Phenix building.

The Electric Signal Manufacturing Company.—This company has opened offices at 45 Broadway, and will handle an improved signaling apparatus, particularly adapted for hotels.

Award at Melbourne Exposition.—The Western Electric Company, of Chicago, received an award at the Melbourne Exposition, Melbourne, Australia, for its exhibit of electric bells, annunciators, etc.

Hazazer & Stanley.—In electric bells this firm has secured a magnificent trade. They are making a specialty of dust proof bells, and are meeting with an appreciation at the hands of the public which is most gratifying.

Mr. J. H. Shay, of the Munson Belting Company, has closed a contract for 140 feet of 40 inch double belting with the Sioux City Cable Road Company. This company is also belting up the Electric Light and Power Company, of Council Bluffs.

Baker & Co.—The very handsome one-half page advertisement of this company of platinum importers and refiners, which has been running in the REVIEW, has attracted much attention, due to the excellent idea of the arrangement and artistic work of the REVIEW printers. Dr. Cyrus O. Baker, Jr., is to be complimented on the design.

Handsomely Bound Catalogue.—The REVIEW is indebted to the Empire City Electric Company for a beautifully morocco bound catalogue, with the name of this journal in gilt on the front cover. Every other page throughout the catalogue is of blank writing paper for making memorandum. The whole is a convenient and artistic work.

The Mather Electric Company, through their Chicago manager, Mr. J. H. Reid, have sold 50 lights to the Centralia Pulp and Water Power Company, Centralia, Wisconsin; 200 lights to the Goodrich Transportation Company, for use on their new passenger boats running between Chicago and Milwaukee; 1,000 lights to the new Spaulding hotel at Duluth, Minnesota.

The Babcock & Wilcox Company.—"Steam" is the title of a very handsome, complete and interesting publication by the Babcock & Wilcox Company, New York. It is profusely illustrated, most artistically printed and contains valuable information on the generation and use of steam. The REVIEW acknowledges with thanks the receipt of a copy of this publication.

The Schuyler Electric Company.—Since moving to its new and extensive factory at Middletown, Conn., the Schuyler Electric Company has been able to turn out electric light apparatus very rapidly, but is still behind its orders. The ventilated armature of the Schuyler dynamo is a very popular feature and one which is appreciated by the consumer, and the excellence of their arc lamp is an additional point that operators of the Schuyler system appreciate.

E. P. Allis & Co.—The Edward P. Allis & Co. engine works, of Milwaukee, are going heavily into the electrical field. They now have contracts on hand for a 500 horse power triple expansion engine for the Narragansett Electric Lighting Company, of Providence, R. I.; a 1,000 horse power triple expansion engine for the West Side Power Company, of Minneapolis; a compound 850 horse power engine for the Brush Electric Light Company, of Buffalo; an 18x36 engine for electric lighting at Ludington, Mich.; a 20x48 engine for Omaha Motor Railway Company, and one 20x48 and one 26x48 engine for the Thomson-Houston Electric Company, of Topeka, Kans. They are also building five pumping engines for new Chicago water works, guaranteed to pump 125,000,000 gallons daily, and four 5,000,000 gallon engines for the city of Albany, New York.

The Robinson-Foster Company.—The Robinson-Foster Electric Railway Motor Co. has purchased the machine shop and electro plating works of the Hall Type Writer Company, corner Derby street, in Salem. This factory was fitted out with the most modern and expensive machinery, and has been established here about two years. The opportunity of obtaining $20,000 worth of material at a low figure for cash was promptly seized by the Robinson-Foster Company, and the purchase completed last week. Men and teams were set to work at once, and the transferring from Salem to their factory at South Peabody was commenced within one hour's time of the sale. The importance, aside from the figure paid, is considerable to the Robinson-Foster Company, as it will allow them to commence to manufacture their motors at once, without the unavoidable delay caused by buying varied styles of machines and tools of different makers in the different parts of the country. The machinery is especially adapted to the manufacture of the small motors, for sewing machines and other light work, the demand for which has been so great that the company has decided to put the whole third floor of their factory to this use. The other floors are equipped with larger and heavier machinery for building large motors and dynamos.

The Ide Engine.—A. L. Ide & Son, Springfield, Ill., have received an order from the Union Iron Works of San Francisco, to deliver, within three weeks, two Ide engines of 150 horse power each, and one of 100 horse power. They have received orders for ten engines in the last two weeks, all to be delivered within 30 days, which necessitates running their works nights. Their new works are in full operation and are turning out from two to three engines per week.

The Ball Engine.—The Edison Illuminating Co., of Brooklyn, through their manager, Mr. Field, has just awarded one of the largest steam engine contracts ever placed in New York, for 12 Ball automatic compound engines of 250 horse-power each, to Charles R. Vincent & Co., of 15 Cortlandt street. These engines will be placed in the new central Edison station in Brooklyn, and will mark the latest development in high speed steam engineering, it being Mr. Field's intention to make this plant a model one in every respect.

The Elektron Manufacturing Company.—The advantage of getting thoroughly ready before coming prominently before the public with apparatus is well demonstrated in the case of the Elektron Manufacturing Company of this city and Brooklyn. The Perret electric motor, since its appearance a few weeks ago, has received a welcome and is already in demand in many parts of the United States. It is a splendid motor and is manufactured in sizes from one-eighth to one and one-half horse-power, and in addition to its electrical efficiency it has its appearance to recommend it, being compact, neatly constructed and carefully finished.

Electric Railway at St. Joseph, Mo.

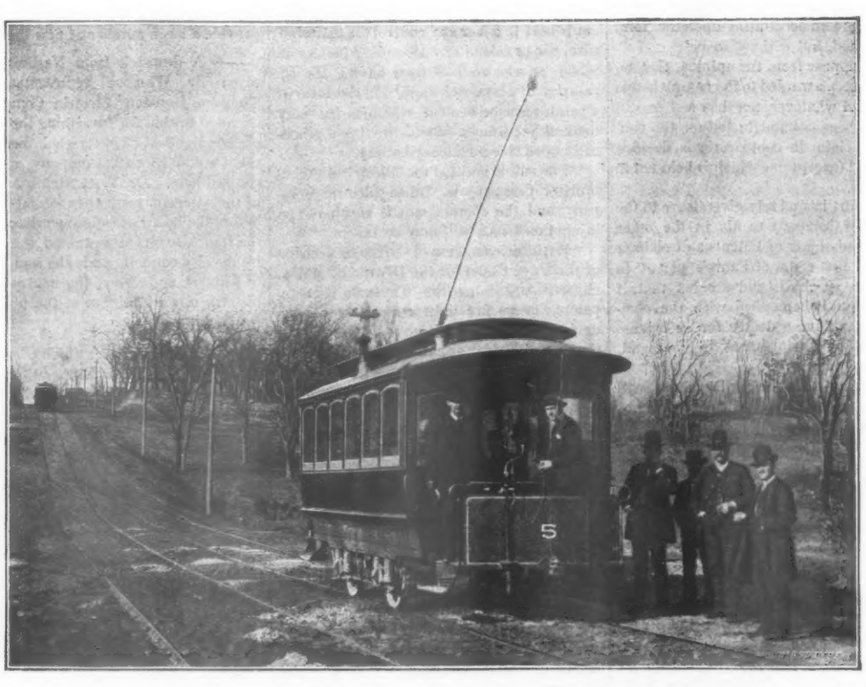
The first electric line to be operated in St. Joseph was the Union Passenger Railway, equipped by the Sprague Electricity and Motor Company, and the success of this line has been so great that the railway company ordered an additional number of cars.

The line at St. Joseph was one of the first in the country to practically demonstrate the successful operation of an electric railway in a snow storm. In the early part of this winter a blizzard from the Western prairies struck St. Joseph with all its force and covered the streets in that city to the depth of from six inches to one foot, and, in many places drifting badly. The telephone, telegraph and electric light wires were borne down by the snow in all parts of the city, and trade was, for the time being, according to one of the local papers, completely paralyzed. In spite of this general blockade in all directions, the electric railway ran uninterruptedly, and the cars plowed their way through the heavy drifts on the line without trouble or stoppage and without any aid from snow-plows.

The road has been very largely patronized by the residents of St. Joseph, and property along the line has greatly increased in value.

The grades on the Wyatt Park Railway are in some points on the road as high as nine per cent. and the cars without difficulty reach a speed of 15 to 18 miles an hour in the outside and suburban districts, reducing to a lower rate of speed when operating within the city.

St. Joseph, Mo., is coming to the front rapidly as one of the leading cities in electrical enterprise in the West. It already has two street railways operating by electricity on the Sprague system, and a great many manufacturing industries are kept in operation by the same power by means of stationary electric motors operated from a regular railway circuit. It is said that the two other street railways in St. Joseph will soon be in operation upon the electric system, so that the horse shall be supplanted entirely in St. Joseph.



VIEW ON WYATT PARK ELECTRIC RAILWAY, SPRAGUE SYSTEM, ST. JOSEPH, MO.

The Dallas Electrical Society.

In order to add to the attractiveness of their rooms, and at the same time have the members become more familiar with the various articles that are manufactured, the Electrical Society, of Dallas, Texas, has established a museum or collection of various electrical books, catalogues, samples, models, etc.

The Society is composed of practical electricians, professors of chemistry, dentists, physicians and insurance men. The cabinet is open for inspection to visitors and the public at times. Mr. J. M. Oram is president of the Society, and Mr. Chas. O. Harris, secretary.

Electricity vs. Gas in Switzerland.

Although it is constantly said that the existing gas works have in no wise suffered by the introduction of the electric light, yet the manufacturers of gas apparatus are complaining of scarcity of orders, there being hardly any new gas works now erected in Switzerland. It is easily understood that the electric light would be preferred to gas in such situations where water power is abundant; but the experience of the last year or two shows that the electric light is cheaper than gas light, even in such cases where the power has to be obtained from steam engines, and hence large manufacturers who have not already a gas supply prefer to put up an electric light installation instead of a local gas plant. In this connection should be mentioned the repairing shops of the St. Gothard Railway, at Bellinzona, which have been among the first to introduce the electric light, and this example has stimulated the municipal authorities of Bellinzona, Lugano, and even the small village of Faido, to invite plans and tenders for central electric light stations. In Luek, which receives a splendid new casino, the electric light will be used as a matter of course. A large billiard factory in Berne has also been fitted up with the electric light, and the same illumination in the town theater of Zug; and these examples may be multiplied to any extent. It is remarkable that the incandescent gas light, although a year or two ago it appeared to give much promise, has never taken a firm hold in Switzerland.—*Industries.*

Election of Officers.

At the annual meeting of the Brush Electric Illuminating Co. of this city, held at 308 Elizabeth street, New York, March 18th, 1889, Mr. W. F. Moore was elected president of the company in place of Col. W. L. Strong, who declined a re-election. Mr. G. McFall was re-elected secretary and treasurer. Col. Strong continues as a director and large stockholder.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING MARCH 19, 1889.

399,401 Prevention of sparking in dynamo-electric machine and electric motors; Daniel Higham Philadelphia, Pa., assignor to the Higham Electric Light Company, Rockland, Me.

399,402 Prevention of sparking in electric generators and motors; Daniel Higham, Philadelphia, Pa., assignor to the Higham Electric Light Company, Rockland, Me.

399,403 Dynamo electric machine; Daniel Higham, Philadelphia, Pa.

399,404 Dynamo electric machine; Daniel Higham, Philadelphia, Pa., assignor to the Higham Electric Light Company, Rockland, Me.

399,409 Conductor for electric railway; Rudolph M. Hunter, Philadelphia, Pa.

399,416 Electric gas lighter; Edward Kronenburg, Philadelphia, Pa.

399,507 Switch for electric motors; Arthur H. Eddy, Hartford, Conn.

399,534 System of electrical distribution and conversion; Thomas H. Hicks, Detroit, Mich., assignor to the Hicks Induction Light and Motor Company, of Michigan.

399,535 Secondary battery; Joseph L. Huber, Hamburg, Germany.

399,550 Electric Switch; Harry T. Paiste, West Chester, Pa.

399,556 Electric railway signal; Theodore A. B. Putnam, New York, N. Y., assignor to the Railway Cab Electric Signal Company, same place.

399,599 Regulator for electrical machinery; Geo. H. Condict, Philadelphia, Pa.

399,639 System of electrical distribution; George Westinghouse, Jr., Pittsburgh, Pa.

399,646 Dynamo electric machine; Joseph W. Balet, New York, N. Y., assignor of one-half to Robert Dunlap and Luke F. Cozans, same place.

399,666 Telephone transmitter; Charles A. Hitchcock, North East, Pa., assignor of two-thirds to Samuel A. Davenport and William Burnley, same place.

399,716 Electrically controlled hydraulic elevator; Charles Whittier, Boston, Mass.

399,732 Electric railway switch; Edward Blake, Boston, Mass.

399,738 Coupling and automatic circuit breaker for fire alarm circuits; John J. Cannan, Rochester, N. Y.

399,748 Incandescent electric lamp socket; Chas. E. Egan, Columbus, Ohio, assignor of one-tenth to N. W. Halley, Tipton, Ind.

399,755 Electrical distribution by secondary batteries; Frank King, Fulham, County of Middlesex, England.

399,786 Electric light support; Benjamin Schardt and George Jones, Dayton, Ohio, assignors of one-third to John R. Fletcher, same place.

399,800 Dynamo electric machine; Elihu Thomson, New Britain, Conn., assignor to the Thomson-Houston Electric Company, of Connecticut.

399,801 Alternate current inductor; Elihu Thomson and Merle J. Wightman, Lynn, Mass.

WANTED.

EXPERIENCED AGENTS WANTED to sell isolated plants and central stations by an electric light company. Kindly send full particulars, experience, and names of plants closed by applicant.

Address, "ELECTRO,"
Care ELECTRICAL REVIEW.

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CREOSOTING CO.
PERTH AMBOY, N. J.

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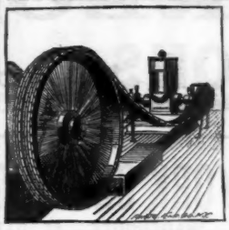
Leather Link Belt Co.



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Leather Link Belting

Specially adapted to DYNAMOS.

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Full Size!!!

NO ONE Denies this to be the only safe automatic in the

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Perfected Improvements Commend it to the Trade.

$6.00 EACH.
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are the best for electricians, railroad men, engineers and others whose vocation requires a watch that is both absolutely non-magnetic and an accurate timekeeper,

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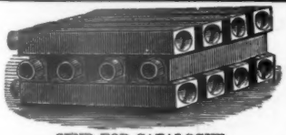

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We have large works for creosoting Lumber, R. R. Ties, Telegraph Poles, &c., &c.
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Take no Porous Cups without Our Label and Trade Mark.
The Leclanché Battery Co., 149 West 18th St., New York.

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MANUFACTURERS OF
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INCLUDING
Medical Batteries, Skeleton and Box Bells, Burglar Alarms, House Annunciators, Fire Alarm Boxes, Pins and Brackets.

Insulated Magnet, Telephone and Electric Light Wire.

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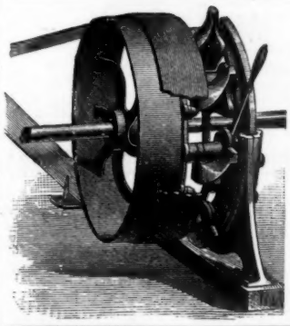
THOSE WHO TRY THE "SAMSON" BATTERY ADOPT IT FOR GENERAL USE, AND GROW MORE AND MORE ENTHUSIASTIC IN ITS PRAISE.

ITS MERITS ARE LASTING, AND LIKE ALL GOOD FRIENDS, IT WEARS WELL, AND IMPROVES ON ACQUAINTANCE.

THE BATTERY IS TO AN ELECTRICAL PLANT WHAT THE DIGESTIVE ORGANS ARE TO A MAN; THE HEALTH OF THE ENTIRE SYSTEM DEPENDS THEREON. A CHEAP BATTERY DOESN'T PAY.

THE ELECTRIC GAS LIGHTING CO.
35 ARCH STREET, BOSTON, MASS.



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We make a Specialty of Threads for Covering Wires for Electrical Purposes.

Samples Sent on Application. *Correspondence Solicited.*

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Importers, Melters and Refiners of
PLATINUM,
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Platinum in sheet and wire, all sizes, and any degree of hardness. Scrap and native platinum purchased

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Plating Machines that require a speed from 1800 to 3600 revolutions per minute are Useless Toys.

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This Company has Manufactured the Largest Belts made in the World for the principal elevators at Chicago, Buffalo and New York.

We make a Superior Quality of Belting for Electric Light purposes, for use on Dynamos and Swift running machinery.

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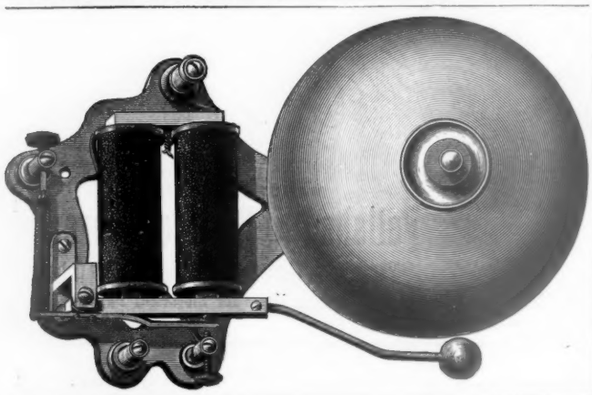

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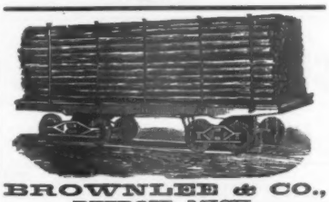

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ASK ANY ONE OF THE MANY USERS OF THE SAME.

THE REASON WHY, is simply because our processes are the most perfect and our materials used in the manufacture are the very best selections that can be obtained.

PRICES ALMOST, BUT NOT QUITE AS LOW AS THE RULING PRICES FOR INFERIOR MAKE.

Porous Cups, 35 cents, Subject to Discount in Quantity.

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EMPIRE CITY ELECTRIC COMPANY,

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O. E. MADDEN, *President.* E. T. GILLILAND, *Vice President.*

OFFICE OF

EMPIRE CITY ELECTRIC CO.,

15 DEY STREET,

New York, March 22d, 1889.

Dear Sir·

We have taken this space for the purpose of calling your attention from week to week to a few of the many articles that we manufacture, or have special facilities for furnishing, on the most advantageous terms.

Our business comprehends the entire line of ELECTRICAL SUPPLIES, and we should be glad to quote prices on anything that you may require.

Trusting to hear from you, we remain,

Yours truly,

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HOBOKEN, N. J., February 12, 1889.

BISHOP GUTTA PERCHA CO.

GENTLEMEN:—I have made an extensive series of tests of your **WHITE CORE INDIA RUBBER INSULATION,** under various conditions of temperature and times of immersion in water, with the following results:

INSULATION RESISTANCE IN MEGOHMS PER MILE.

Time, - -	5 min.	1 hour	24 hours	10 days	24 days
Temperature,	60° F.	60° F.	60° F.	60° F.	60° F.
Resistance, -	3,200	3,300	3,300	3,300	3,300

Time, - -	30 min.	30 min.	30 min.	30 min.
Temperature,	41° F.	115° F.	167° F.	200° F.
Resistance, -	3,900	162	12	5 2

The times given in the upper table are those between the immersion of the wire in water and the making of the test.

The times of the second table indicate the time between that at which the tank reached the indicated temperature and that at which the test was made.

The cable had been immersed in water for a month before the first temperature test was made.

It will be observed that the temperature being at 60° F. the resistance remained constant at its highest point for 24 days, and then ran greatly on lowering the temperature.

The lowering of resistance by a rise in the temperature is a common characteristic of all such insulations and indicates no defect. Most insulations are much more affected by this cause than was this one.

This wire also showed no deterioration from exposure to moist air, fresh plaster, damp earth, etc., after several month's exposure. Its insulating power also was unaffected by a like exposure to illuminating gas. Very truly yours,

(Signed) **HENRY MORTON.**

ELECTRICAL TESTING BUREAU,

JOHNS HOPKINS UNIVERSITY.

REPORT of a series of tests of the insulation resistance, capacity and conductivity of a sample covered wire sent by

The India Rubber & Gutta Percha Insulating Co.

The sample submitted for measurement was 2027 ft. in length.
Thickness of insulation was .281 c. m.
Diameter of wire .1632 c. m.

The wire was extremely flexible and was coiled and uncoiled several times before measurements were made.

The insulation consisted of several layers of India rubber, with an external cotton braiding.

The coil was immersed in water on Dec. 16 at 8.30 P. M., and tests were begun the following morning. Both the Direct and Loss of Charge methods were employed. The following are the results:

Capacity in Microfarads per Knot.	Insulation Resistance in Megohms per Knot.	Temperature Centigrade, Degrees.	DATE.
.453	11240	8.5	Dec. 17
.441	9558	13.3	Dec. 18
.456	10080	13.0	Dec. 19
.441	10183	11.0	Dec. 20
.450	9620	10.8	Dec. 21
.450	10000	12.0	Dec. 27

Direct deflection 7200 meghoms per knot at 12° C. on Dec. 27th. Conductivity was obtained by making a number of measurements of the diameter of the wire, and a determination of the resistance of the entire length of the sample at a definite temperature.

The conductivity was 98.5 per cent. that of pure copper as given by Matthiessen.

For the eleven days that the wire was in water the insulation resistance remained practically unchanged, and the slight variation which occurred can be accounted for by the difference in temperature, etc.

The insulation seems to be less affected by changes in temperature than that of other samples which we have tested at various times. Very respectfully,

[Signed] **LOUIS DUNCAN,**
C. A. LIEBIG, Jr.

JANUARY 5th, 1889,
WM. M. HABIRSHAW.

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FIRE, ACID, AND WATERPROOF. GRIMSHAW TAPE.
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649 & 651 BROADWAY, N. Y.

The Thomson-Houston Electric Co.,
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DYNAMOS AND LAMPS
FOR INCANDESCENT LIGHTING.
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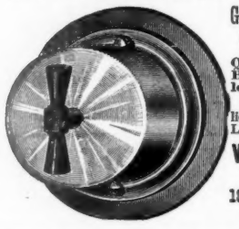

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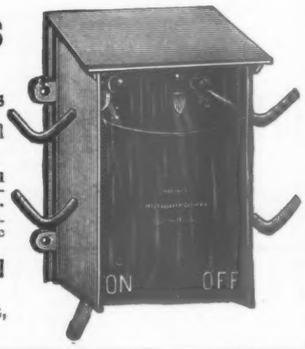

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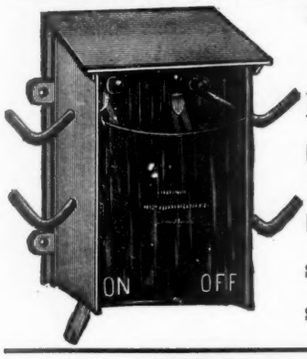

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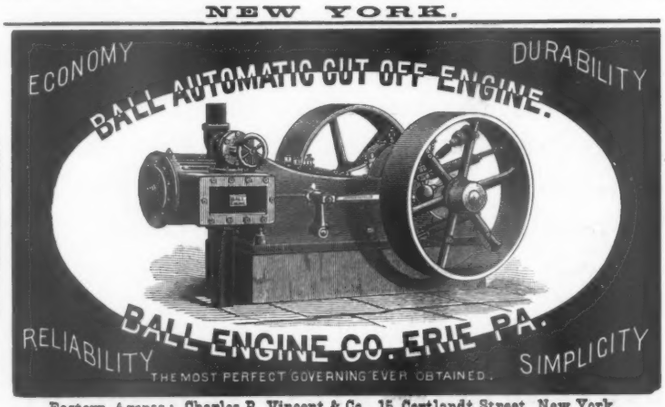

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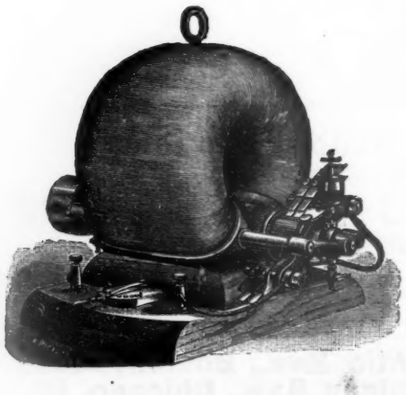

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IS THE INCANDESCENT LAMP AN EDISON MONOPOLY?

One Dozen Selected Extracts from Documents in the Case.

I.

Extract from a widely circulated and well-known publication, entitled **A Warning from the Edison Electric Light Company,** commonly called the "Red Book."

Mr. Edison's fundamental lamp patent, No. 223,898, was applied for November 4, 1879, and issued January 27, 1880. The claims are as follows:

1. **An electric lamp** for giving light by incandescence, consisting of a **filament of carbon** of high resistance made as described, and secured to **metallic wires,** as set forth.

2. The combination of **carbon filaments,** with a **receiver** made entirely of glass, and **conductors** passing through the glass, and from which receiver the **air is exhausted,** for the purpose set forth [page 33].

II.

Extract from card of **Edward H. Johnson,** President of the **Edison Electric Light Company,** May 24, 1885.

Edison's patent of January 27, 1880, applied for at the time of his **great discovery, covers broadly all the elements of that discovery,** and is, therefore, **fundamental and controlling** [page 5].

III.

Extract from **A Warning from the Edison Electric Light Company.**

It is **impossible to construct any lamp** of commercial utility **without employing Edison's filament of carbon** [page 6].

IV.

Extract from **A Warning from the Edison Electric Light Company.**

The lamp covered by the above-mentioned patent is the **key** to the **entire industry** of incandescent electric lighting [page 9].

V.

Extract from **Revised Statutes of the United States** [Section 4887].

Every patent granted for an invention which has been previously patented in a foreign country **shall be so limited as to expire at the same time with the foreign patent,** or, if there be more than one, at the same time with the one having the shortest term, and in no case shall it be in force for more than seventeen years.

VI.

Extracts from **Opinion** of the **United States Supreme Court** in the **Bate Refrigerator Case,** January 21, 1889.

These provisions of the Act of 1870, and of the Revised Statutes, mean that the United States patent shall not expire so long as the foreign patent continues to exist, not extending beyond seventeen years from the date of the United States patent, but shall continue in force, though not longer than seventeen years from its date, so long as the foreign patent continues to exist. * * * * * **It is to be in force as long as the foreign patent is in force.** * * * A contrary view to this has been expressed by several Circuit Courts of the United States. * * * * The time of the expiration of the foreign patent may be shown by evidence *in pais*, whether the record of the foreign patent itself, showing its duration, or other proper evidence.

VII.

Extract from Advertisement signed by **Edward H. Johnson,** President of the **Edison Electric Light Company,** in ELECTRICAL REVIEW, February 2, 1889.

The Edison Electric Light Company takes pleasure in announcing to its patrons and the general public, that the decision of the Supreme Court of the United States, filed on the 21 inst., in the case of the **Bate Refrigerator Company,** is in fact **a decision sustaining the Edison patents.**

VIII.

Extract from **Revised Statutes of Canada** [Cap. 61, Sec. 37].

Every patent granted under this Act, shall be subject and be expressed to be subject to the condition that **such patent** and all the rights and privileges thereby granted **shall cease and determine,** and that the patent shall be **null and void** at the end of **two years** from the date thereof, unless the patentee or his legal representatives, within that period, commence, and, after such commencement, continuously **carry on in Canada, the construction or manufacture of the invention** patented, in such manner that any person desiring to use it may obtain it, or cause it to be made for him, at a reasonable price, at some manufactory or establishment for making or constructing it in Canada, and that **such patent shall be void** if, after the expiration of **twelve months** from the granting thereof, the patentee or his legal representatives or his assignee for the whole or part of his interest in the patent **imports or causes to be imported into Canada,** the invention for which the patent is granted; and if any dispute arises as to whether a patent has or has not become null and void under the provisions of this section, such dispute shall be decided by the **Minister or the Deputy of the Minister of Agriculture,** whose decision in the matter **shall be final.**

IX.

Extract from claims of Canadian patent of **Thomas Alva Edison,** No. 10,654, November 17, 1879.

First. An electric lamp for giving light by incandescence, consisting of a **filament of carbon** of high resistance made as described, and secured to **metallic wires** as set forth.

Second. The combination of **carbon filaments** within a **receiver** made entirely of glass through which the **leading wires** pass, and from which receiver the **air is exhausted** for the purpose set forth [compare I. ante].

X.

Extracts from Decisions of **Deputy-Minister of Agriculture,** of Canada, Ottawa, February 26, 1889.

I, therefore, hold, that the **Minister of Agriculture,** or his Deputy, has **exclusive jurisdiction** as to the question of the **validity of the patent** under the 37th section of **The Patent Act,** and cannot divest himself of it by relegating it to any other tribunal whatever. * * * * * * * *

It is manifestly clear that the **essential feature** or element **of the invention,** as particularly described in the first and second claims is **a carbon filament of high resistance;** this is the novelty which the inventor has contributed to the art of incandescent lighting, and it cannot be disputed by any one having the slightest acquaintance with patent law, that the carbon filament, as imported by the patentee and his representatives, the respondents, and which they still continue to import, is claimed in and covered by the patent; or that any one who should use it, without the permission or consent of the respondents, would render himself liable to them in an action for infringement of the patent. * * * * * * * * *

I find that **every essential feature, element, and component part of the invention** was, and still continues to be, **imported into Canada** by the respondents, **in a manufactured state,** for the especial purpose of assembling or putting them together, so as to make an **incandescent electric lamp,** such as that **described and claimed in the patent** held by them and now in dispute. * * * * * * * * * *

I therefore hold, that the patentee and his representatives have **imported into Canada,** since the 17th day of November, 1880, **and still continue to import,** the various elements and parts comprising **the invention claimed in the patent No. 10,654,** in a **manufactured state;** and that they have **not at any time** since the date thereof, **manufactured the invention in Canada.** * * * * * * *

I accordingly decide that the **Patent** granted to **THOMAS ALVA EDISON,** on the 17th of November, 1879, under the number 10,654 for **the Edison Electric Lamp** has become **null and void,** under the Provisions of the 37th section of **The Patent Act.** [For effect of this decision, compare V. and VI. ante.]

XI.

Extract from interview with **Edward H. Johnson,** President of the **Edison Electric Light Company,** reported in New York *Evening Post,* March 9th, 1889, in which Mr. Johnson said:

We expected **a** decision, but not **this** one.

XII.

Extract from the New York *Electrical Engineer,* March, 1889.

Under the decision of the United States Supreme Court recently given in the Bate Refrigerator case, **Edison's fundamental lamp patent** in the United States No. 223,898, would seem to be **dead beyond hope of resurrection.**

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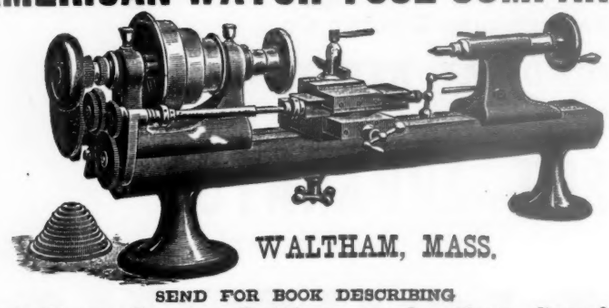

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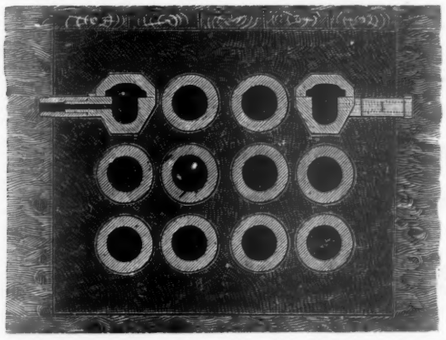

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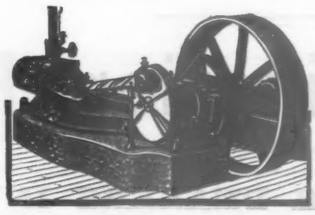

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Also sealed proposals will be received at the same time, for furnishing said city with plant of sufficient capacity to do the above work, with sufficient reserve, said plant to be complete in every respect.

The city reserves the right to reject any or all bids.
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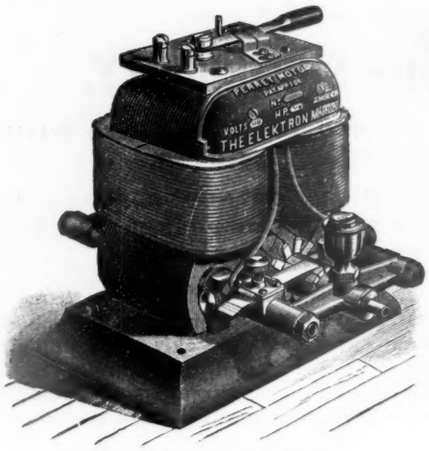

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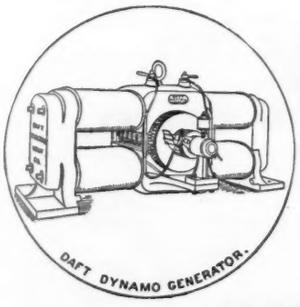

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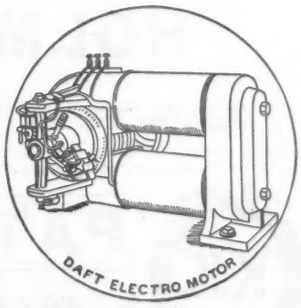

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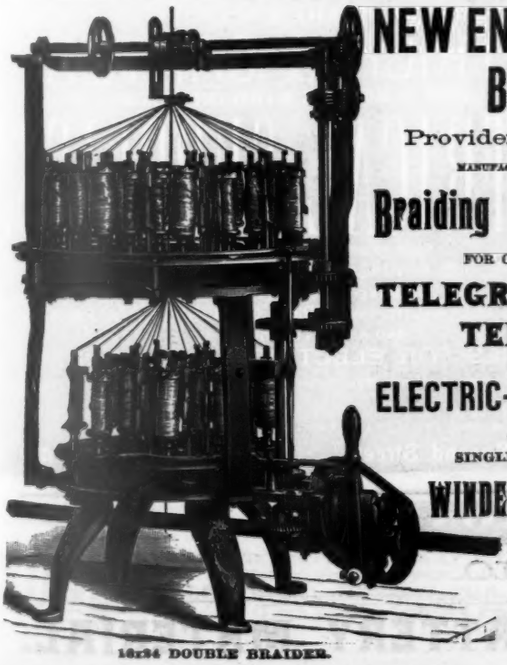

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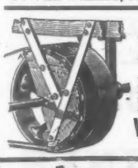

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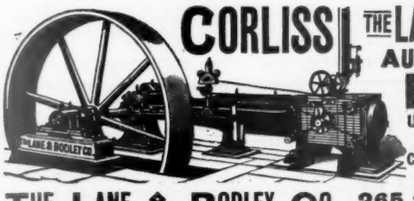

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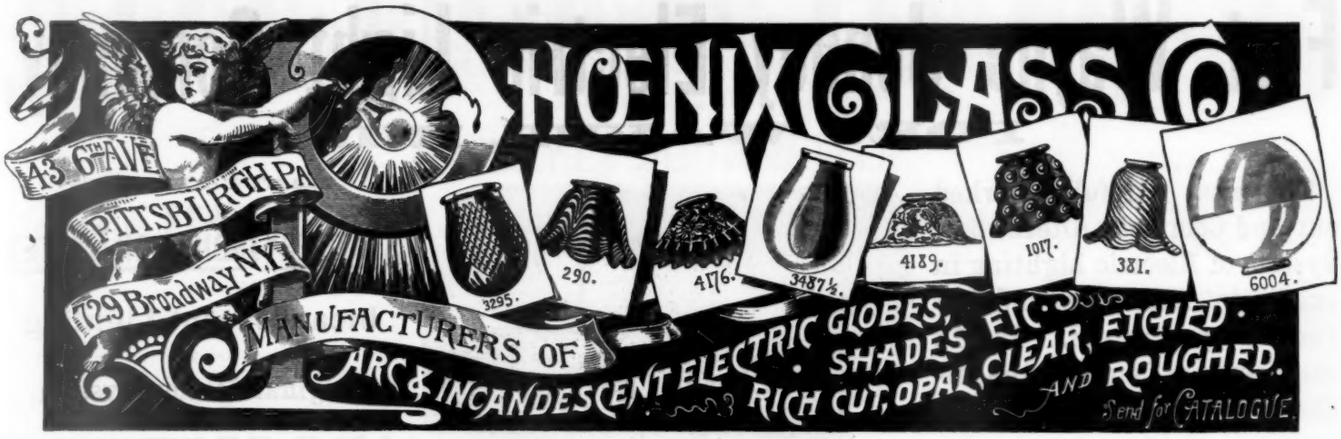

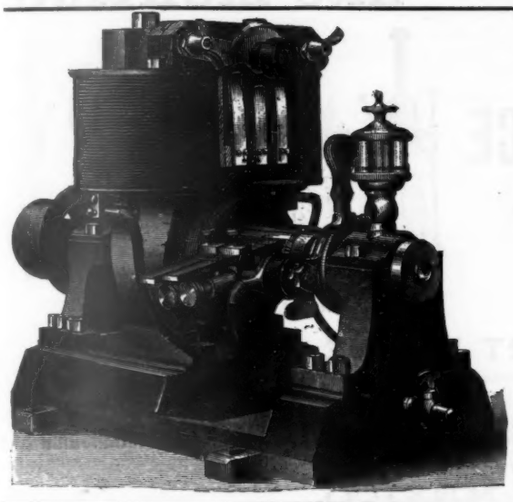

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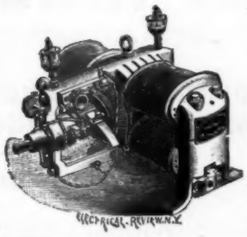

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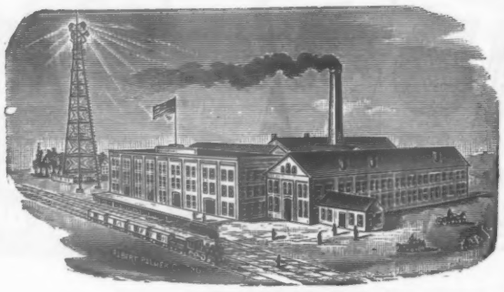

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